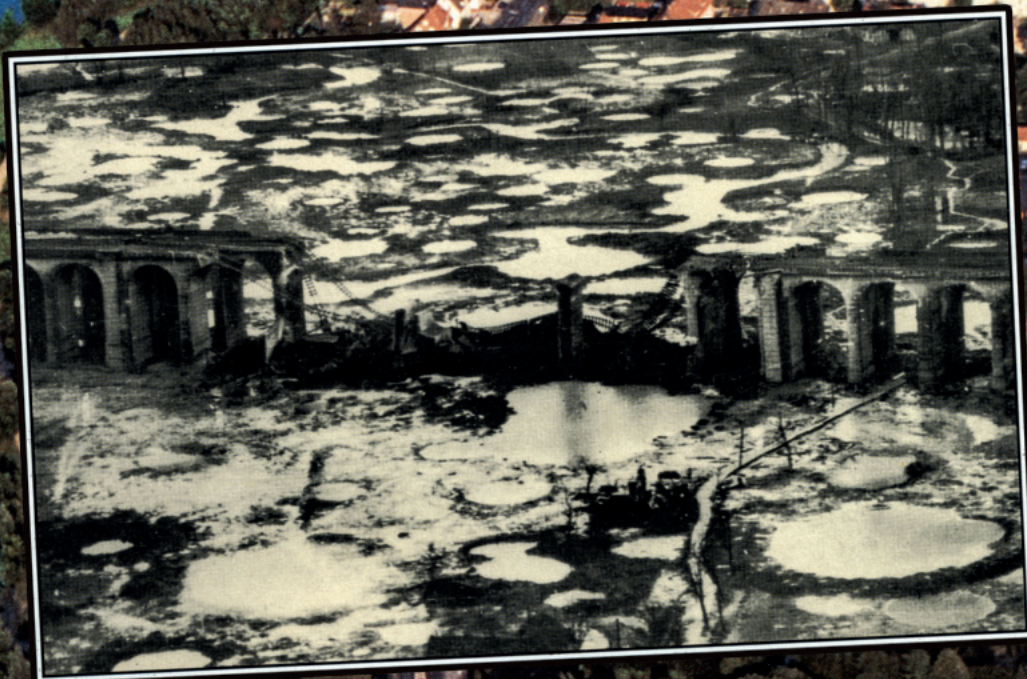


AFTER THE BATTLE



**THE BIELEFELD VIADUCT
POISON GAS IN WWII
INCIDENT AT MOSTY**



Number 79

AFTER THE BATTLE

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Front Cover: As one of Germany's strategic arteries, the railway viaduct at Bielefeld, north of the Ruhr, was a prime target for the Allied air forces. It was finally demolished on March 14, 1945 by a 10-ton 'Grand Slam' bomb dropped by 617 Squadron, RAF. (D. Wittig)

Centre Pages: The mouldering remains of the mustard gas depot at Swinderby in Lincolnshire.

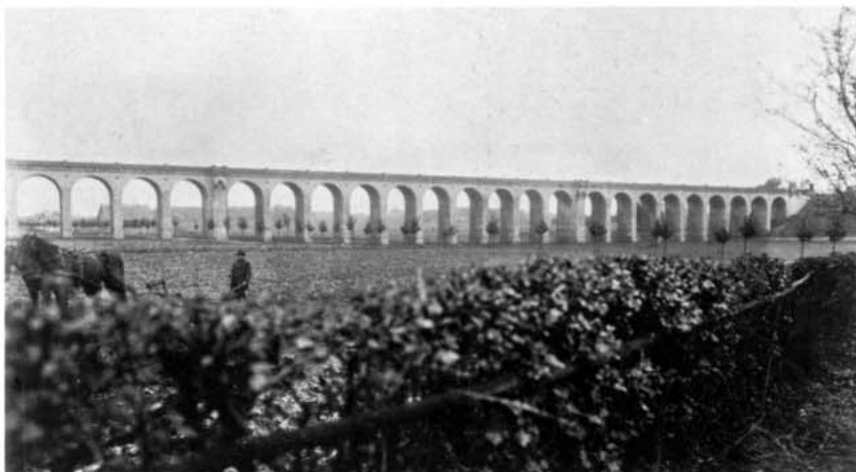
Back Cover: Comparison in colour at Mosty station in southern Poland. The German 'commando' group poses on the railway platform after their successful capture of the nearby rail tunnels five days before the outbreak of war in 1939. (Leutnant Herzner/Jan Heitmann)

Acknowledgements: Much of the information in the Bielefeld Viaduct story comes from Axel Frick's *Als in Schildesche die Erde bebte. Die Geschichte des Viaduktes* (Heka Verlag: Leopoldshöhe, 1985). Karel Margry would also like to thank Jim Shortland, 617 Squadron historian; Jan van den Drieschen; and Malcolm Brooke for their help in preparing this article.

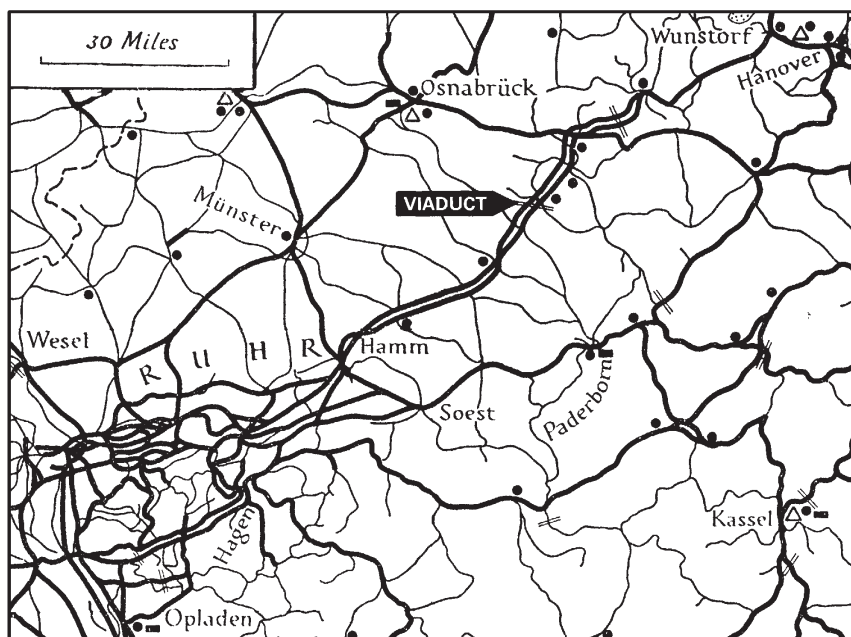
The Bari story is based on Glenn B. Infield: *Disaster at Bari* (The Macmillan Company: New York, 1971).

Photo Credits: SB — Stadtarchiv Bielefeld.

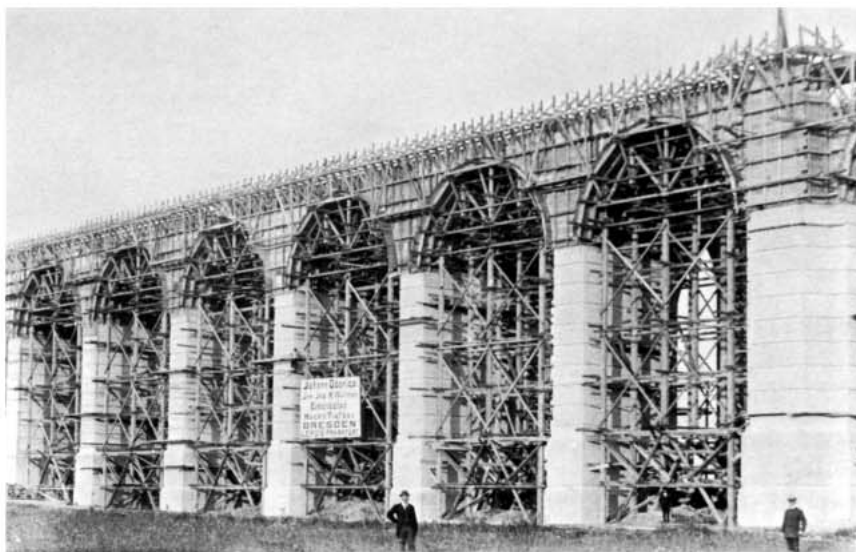
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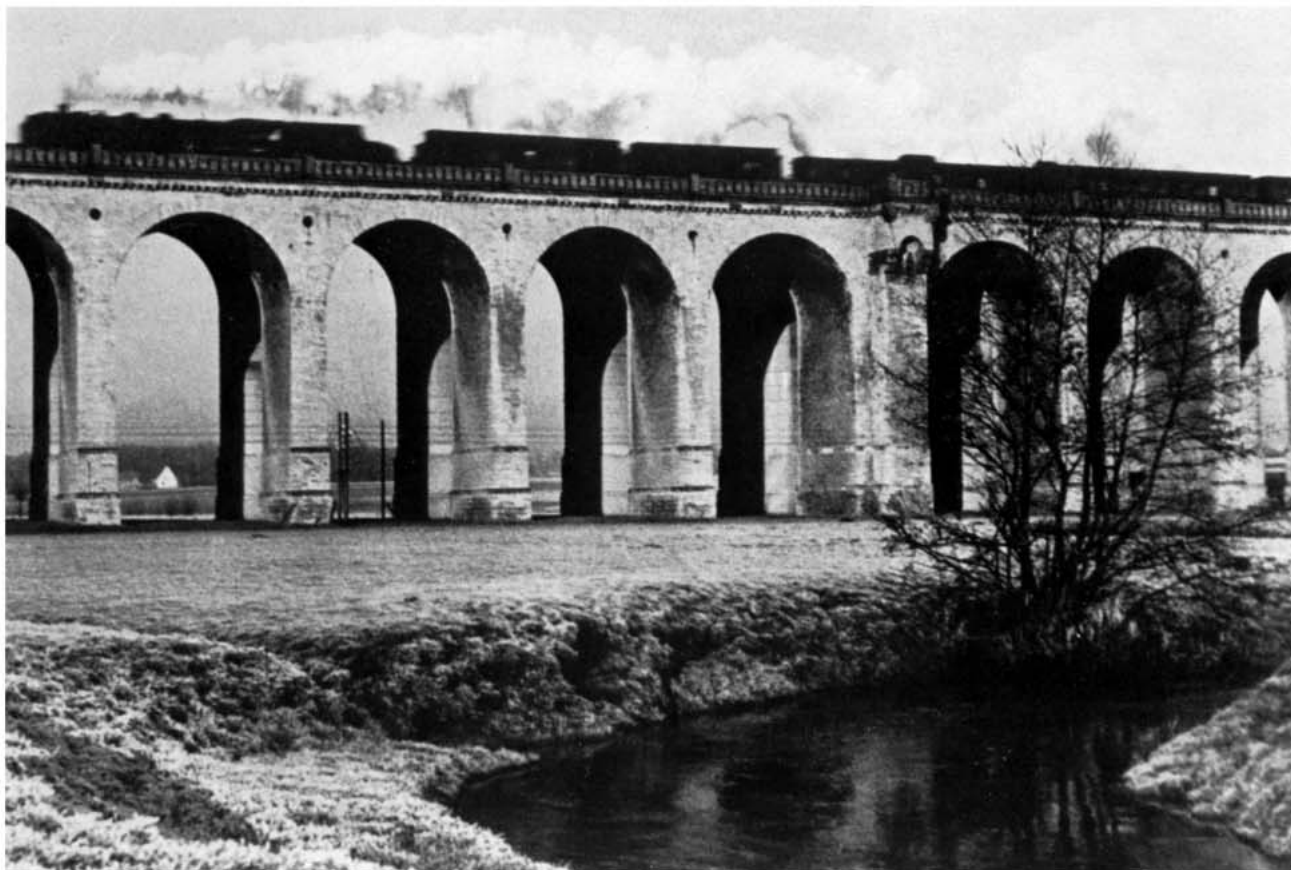


The original twin-track railway viaduct built in 1844-47 to span the Johannisbach valley on the north-eastern outskirts of Bielefeld. This picture dates from 1903. (SB)



A second span was added in 1917 (below) to enable the track to be quadrupled. By the Second World War, the Hamm-Wunsdorf section of the line carried the heaviest tonnage of freight anywhere in Germany, with a daily capacity of 144 trains each way of 600 tons net load. (SB) Above: The line running north-east from the industrial heartland of the Ruhr was a vital strategic link with Hannover and Berlin and, as such, a prime target for the Allied air forces.





Bielefeld is a medium-sized industrial town in Westphalia in north-west Germany. What became known in 1939-1945 as the Bielefeld Viaduct actually lies a few miles north-east of the town, in the direction of Herford. Spanning the low valley of the Johannisbach creek, between the suburban village of Schildesche in the south-west and Brake in the north-east, it is locally known as the 'Schildescher Viadukt'.

Built by the Cöln-Minden Eisenbahngesellschaft (Cologne to Minden Railway Company) in 1844-1847, it formed an important link in the German railway system, the line being part of the 'East-West Axis' between Berlin and Cologne, as well as connecting the Ruhr industrial area with northern ports like Bremen and Hamburg.

With a series of stone archways, its design followed the example of the Roman aqueducts and its construction, led by Chief Engineer Hesekei, was a remarkable feat of engineering. Some 150,000 cubic metres of stone were used in the project and, because of the marshy ground, thousands of piles had to be rammed into the soft soil to create a base for the concrete foundations. In the course of the building, an incident occurred on July 10-11, 1845, which became famous as the 'Schildescher Viadukt Uproar', when the entire 2,000-man labour force on the viaduct went on strike for higher and more secure wages. Unable to stop the disturbance, the authorities called in a battalion of fusiliers who quelled the strike by force; 75 workmen were arrested and 23 imprisoned.

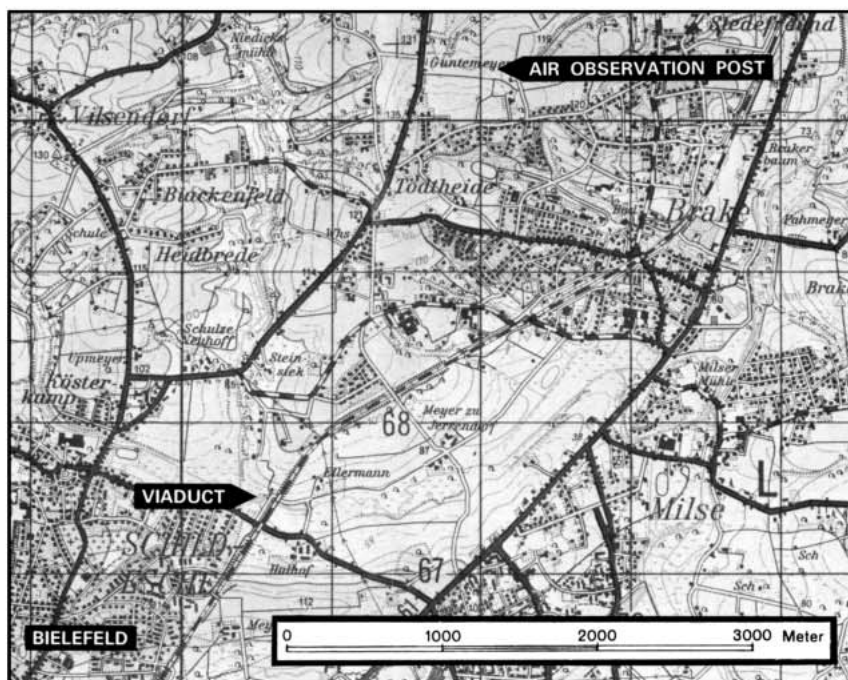
When finished in October 1847, the viaduct was 400 metres long, 10 metres wide, 20 metres high and consisted of 28 graceful archways. For many years it was the longest viaduct in the Prussian state and considered by many to be 'the most beautiful railway construction between Hannover and Cologne'. Initially, the viaduct was only a single bridge with a twin-track railway. However, as traffic increased — by 1900 nearly 200 trains were passing the viaduct each day — the railway authorities decided to expand the

THE BIELEFELD VIADUCT

By Karel Margry

line to four tracks and, in 1914, work was begun on a second viaduct next to and running parallel with the old one. With German workers fighting at the front, Chief Engineer Ernst König made use of Russian and Italian labourers and, later, of prisoners-of-war. Of identical design as its neighbour,

the second bridge was completed in 1917. From now on, the old double-track was reserved for passenger trains, the new one being used for goods trains.



The present-day terrain north of Bielefeld at a scale of 1:50000.



Naturally defences against air attack were paramount and an air raid observation post (left) was established on a hill near Höner zu Guntenhausen farm north of the village of Tödtheide.

From L-R: Wilhelm Kreimeier, Paul Stender, Robert Wiedemann and Heinrich Heidemann. Right: Karel Margry could find no trace of the former installation in October 1992.

Twenty years later, Europe again found itself at war, making the twin viaduct even more vital, and by now 300 trains crossed the bridge each day. The strategic importance of the Bielefeld viaduct was quickly realised by the Western Allies, and between 1940 and 1945 it suffered no less than 54 bomber raids.

To defend the viaduct against air attack, several measures were taken by the Germans. An air observation post was set up at the highest point in the vicinity, the Höner zu Guntenhausen meadow. A 20mm flak gun battery with searchlights, manned by about 24 teenage boys, was positioned on the slope above the viaduct, the young gun crews being billeted in nearby huts. To conceal the bridge in case of an air attack, a Wehrmacht 'Nebel-Kompanie' with smoke generators was stationed two miles north-east of the viaduct, in a field along the railway line near the Aa River bridge. The 60-odd Austrians that made up the company were billeted at the Kisker silk factory in nearby Milse.

The attacks against the viaduct began in earnest in the months following D-Day in 1944, forming part of the SHAEF's plan to disrupt the German communication system and seal off the Ruhr industrial area. Initially, the viaduct was a target of the US Eighth Air Force and for several months B-24s of the 2nd Bomb Division attempted to breach it with 500lb and 1,000lb bombs, but without success.

On September 30, 1944, a heavy raid on Bielefeld town completely destroyed the inner city, killing over 600 inhabitants. Although the viaduct itself was not the prime target, several bombs fell around it.

On November 2, the Americans bombed the viaduct for 50 minutes. Down below, at the farms and houses along the Johannisbachtal-Strasse which passes underneath the viaduct, families huddled in cellars and makeshift air raid shelters. In all, 14 people were killed here, another 28 in nearby Brake, and still more in Schildesche and Vilsendorf. The viaduct, however, was only slightly damaged.

The heaviest attack took place on November 26, when some 100 bombers dropped 495 HE bombs and 2 phosphorous bombs on and around the viaduct. Although the span was not brought down, 17 bombs hit the track, and train traffic was interrupted for 24 hours. Again, civilian casualties were heavy. Close to the bridge lay two farms, the Halhof and the Oberhof, run by Bodelschwinghian colonists, and by sisters of the diaconal Order of Sarepta respectively. Both were completely destroyed by the bombing, 14 of the inhabitants being killed in the raid. Schildesche and Brake each lost 15 inhabitants. The attack had come on what is known



Above: The ruins of the Halhof farm destroyed in the Eighth Air Force raid on November 26, 1944. B-24s from the 2nd Bombardment Division and B-17s of the 3rd Bomb Division struck the target and saturated the surrounding area. (SB) Below: Karel determined that the picture had been taken looking south-east with the viaduct behind the photographer.



Having suffered three heavy raids by the Americans in November, the Deutsche Reichsbahn authorities decided to insure against the disruption should the viaduct be put out of action. Construction of a bypass across the valley floor began on December 1 (not after the war as incorrectly stated in the British official history of the air offensive against Germany). Because of the precarious nature of the new track, the bypass was soon dubbed the 'Gummi-Bahn' or Rubber Line.

in Germany as 'Dead Sunday' (the Sunday before Advent) and for the survivors, the name thereafter would have a double meaning.

Three days later, on November 29, the bombers returned yet again. When the alarm came, two trains were just nearing the viaduct. The trains stopped, their passengers jumping off to look for shelter in farms and bomb craters. There were many casualties (five of the bodies were not found until the following summer) and the bombs flattened the last remaining buildings around the viaduct. After this raid, the last families abandoned their houses and fled.

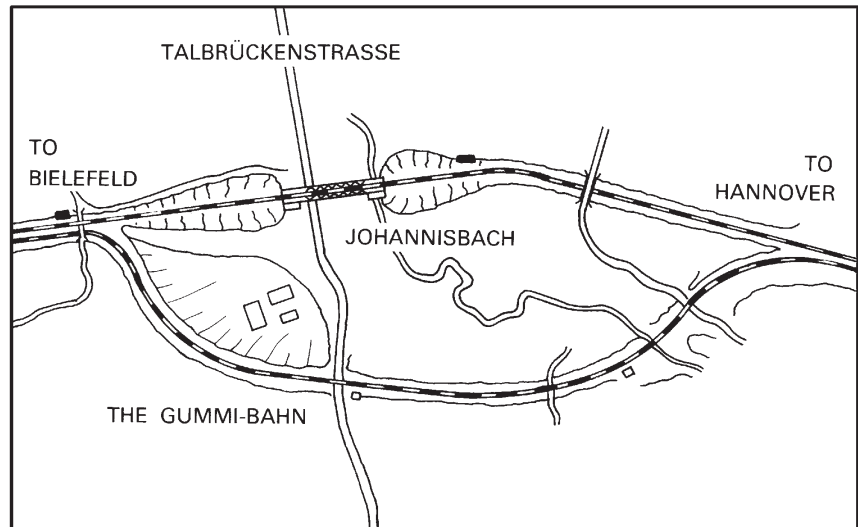
In all, the Americans dropped 2,151 high explosive bombs and 33,000 incendiaries on the viaduct in November. They had damaged two spans and a pier, but the Germans had been able to relay the track by placing girders across the damaged sections. The concentrated bombing left the countryside unrecognisably changed, with ploughed-up fields, uprooted trees, moonscape craters, ruined farms. Winter rains turned the crater landscape in a nightmare sea of waterfilled holes and deep mud which turned refugees into miserable creatures and hampered repair work. The area was alive with unexploded bombs, and the bomb disposal workers — the 'suicide squads' — had a difficult time even reaching the UXBs.

To prepare for the possibility of serious damage to or destruction of the viaduct, the Germans decided to build a loop line which would bypass it. Construction of this line began on December 1, the work being carried out by the Organisation Todt using a force of 2,000 men, mostly slave labourers from occupied countries. Most of the work was done at night. The 3.4-kilometre-long single-track line branched off at the Sattelmeyerhof farm, descended into the valley, crossed the valley road and the Johannisbach creek and rejoined the main line at the Brake signal box. Because of the tight curves, the maximum speed was limited to 50 km/h. Three locomotives had to be held at permanent standby at Brake Station in case heavy goods trains needed an extra push up the strong gradient. The line was so shaky that it became known as the 'Gummi-Bahn' ('rubber track') and, although it was planned as a temporary expedient, it was to remain in use for over 20 years!

In February 1945, with the Allied armies fighting west of the Rhine, SHAEF decided to renew its offensive to isolate the Ruhr industrial area from the rest of Germany. The so-called Ruhr Plan, adopted on February 10, specified roads centres, waterways and railway lines to be attacked and listed 18 weak chains in the transport system, mostly bridges and viaducts, as targets to be destroyed. The Bielefeld viaduct was very high on the list.

The experience of the Americans had shown that the viaduct was too difficult a target to be destroyed by a direct hit with conventional bombs. Therefore, it was now assigned to RAF Bomber Command's 617

Right: The loop was taken up in 1964 and absolutely no trace of it can be seen today. This is where it met the main line at the small overpass bridge leading from Schildesche to the Meyer zu Eissen farm.



Above: The Gummi-Bahn photographed at the spot where it joined the main track south of the viaduct. During the war it was only a single track, but the emergency wartime expedient became semi-permanent in 1945 with the addition of a second set of rails. This picture was taken in March 1953. (SB)





Squadron, the unit that had breached the Möhne and Eder dams in May 1943 (see *After the Battle* No. 3) and had since become Bomber Command's special elite squadron. To eliminate the viaduct, the 'Dambusters' were to use the heaviest bomb then existing, a 5-ton missile known as the 'Tallboy'. If that did not work, they were to use an even heavier bomb still being developed, a 10-ton beast known as the 'Grand Slam'.

The Tallboy and the Grand Slam were the largest and heaviest bombs developed by any nation in the Second World War. Both were an invention of the renowned designer and scientist Barnes Wallis, the same man who had invented the rotating bomb with which 617 Squadron had broken the Ruhr dams in 1943. For years, Wallis had been preaching the doctrine not merely of a 10-ton bomb, but of a 10-ton bomb with penetration capacity that could set up in the target an 'earthquake' effect. Instead of relying on a direct hit, he proposed to use the pressure wave set up by the detonation in the surrounding medium to 'shake' the target to pieces. That medium could be water or, better still, earth. To obtain maximum penetration, and to release maximum kinetic energy, the bomb must be released from a great height (his suggestion was 40,000 feet, later adjusted to 22,000 feet). Earlier in the war, it had been the absence of a bomber which could carry that much weight to such a height that had given an excuse for the proposals to be rejected, but with the advent of the Lancaster bomber and the development of efficient bomb-sights, such excuses were no longer valid.

After the success of the Dams Raid, more attention was paid to Wallis' seemingly impossible ideas and this led to the production of a scaled-down version of the 10-ton

Apart from a lot of craters, there was little to show for the three American raids in November with the line still in operation. Meanwhile, the energies of the Allied air forces were otherwise preoccupied with Hitler's sudden offensive through the Ardennes. However, once Allied ground forces began closing the Rhine, a new SHAEF directive designated the viaduct as one of the vital targets to be put out of action to seal up the Ruhr. Nevertheless, it was seen that conventional bombs could do little permanent damage to the massive stone piers, so the RAF's specialist squadron, No. 617, was given the task of trying to demolish it using the largest bomb then available. The 12,000lb 'Tallboy' had already achieved success against the supposedly bomb-proof U-Boat and V-weapon bunkers along the coast of France. Two viaducts, the one at Bielefeld and another at Altenbeken (near Paderborn), were earmarked as targets on February 6 and 14, but both operations had to be aborted because of cloud. These pictures were taken of the second Tallboy operation against Bielefeld on February 22, the cameraman being Pilot Officer Heath in a 627 Squadron Mosquito. One of the 18 Lancasters can be seen flying at around 15,000 feet as it crosses the viaduct shortly after 4.00 p.m. The second frame has been specially selected to show the bomb at the moment of impact just north of the river. As the explosion erupts, it looks as if a hit has been scored but it failed to cause any major damage. (IWM)

bomb, a 12,000lb penetration bomb which was known as the Tallboy. From June 1944, it was used with great success against the V-weapon sites in northern France (see *After the Battle* No. 6), against the E-Boat and U-Boat pens along the Atlantic coast (see *After the Battle* No. 55), and against the battleship *Tirpitz* in its Norwegian fjord hiding place. Meanwhile, plans for the development of the 10-ton bomb, now christened Grand Slam, were also pushed ahead and arrangements were made for its production both in England and in the United States. However, this progress was arrested in September 1944, when, in the light of the War Cabinet's expectation that the war would be over by Christmas, the Air Staff cancelled Grand Slam production in both countries. This was an unfortunate decision, but it was redeemed in October by a far-sighted, independent and courageous decision by the Chief Executive at the Ministry of Aircraft Production, Air Chief Marshal Sir Wilfrid Freeman.

The first two Tallboy missions by 617 Squadron against the Bielefeld viaduct, on February 6 and February 14, were aborted because of bad weather and low cloud respectively. On February 22, the weather was better and 617 Squadron was able to drop 18 Tallboys on the viaduct. The crews believed that at least one bomb had hit the target, but this was not true. Although the track had been seriously damaged, the bridge was still intact and repair teams of the Organisation Todt quickly succeeded in making good the damage.

A fortnight later, on March 9, the squadron's Lancasters were yet again sent to attack the viaduct. Having been so many times recently, the crews were able to navigate to the target without the aid of maps, but once again the mission was aborted because of low cloud. By now, over seven million pounds of high explosive had been dropped on the structure but still it stood, chipped and pock-marked by numerous hits and near misses.



Meanwhile, the first Grand Slams had arrived from the production lines. Weighing 22,000 pounds (9975kg) and with a length of 26 feet (7.74 metres) and a diameter of 5 feet (1.15 metres), it was the biggest bomb ever. Its case was a casting of special chrome molybdenum steel with a total weight of Torpex explosive of some 9,975 pounds (4110kg). A specially-designed Lancaster — the B1 Special — was needed to carry this huge bomb as the normal capacity of a Lanc was 6.34 tons. The modifications included a cut-away bomb bay and strengthened undercarriage, and also the fitting of four 1,280 hp Rolls-Royce Merlin engines. To lessen the take-off weight, no wireless operator or mid-upper gunner were carried.

The ideal height for dropping the Grand Slam had been calculated at 22,000 feet and on March 13, 1945, the first explosive-filled Grand Slam was experimentally dropped on the Ashley Walk bombing range (see *After the Battle* No. 72) which produced a crater 30 feet deep and 124 feet in diameter.

That very same day the first operational Grand Slam mission was laid on by 617 Squadron. The target was again the Bielefeld viaduct. Two Grand Slams were available, to be flown by the squadron CO, Group Captain J. E. 'Johnny' Fauquier, and by Squadron Leader Charles 'Jock' Calder. Taking off from Woodhall Spa, they had to use the whole length of the runway to get their heavily-loaded Lancasters airborne. To the crews' utter frustration, for the fourth time in five missions, 617 Squadron encountered bad weather and had to return to base, and Fauquier and Calder were forced to land with their Grand Slams aboard. Not taking any risks, Fauquier decided they should use the longer runway at RAF Carnaby for the landing, which was accomplished without incident. (They were, however, not the first men in history to land with a 10-ton bomb on board; that credit goes to Squadron Leader Hedley 'Hazel' Hazelden, a test pilot at Boscombe Down who test-flew the first Grand Slam Lancaster in November 1944.)

The same mission was immediately re-scheduled for next day. Sixteen Lancasters were to be despatched, fourteen carrying Tallboys and two with Grand Slams. The Grand Slam Lancasters were again to be flown by Fauquier and Calder. (Their ground crews travelled overnight from Woodhall Spa to service the two bombers at Carnaby.) The Lancasters were to be escorted by five Mosquitos: four Oboc-marking Mosquitos of the No. 8 Group



The ultimate conventional weapon. Whereas the Tallboy was a scaled-down version of Barnes Wallis' 'earthquake' bomb, the Grand Slam was the real thing. Weighing in at 22,000lbs — 10 tons — the English Steel Corporation at Sheffield made the case while the tail cones were produced by Shorts at Rochester. (IWM)



Overgrown but not forgotten — the ultra heavy bomb store at Woodhall Spa today. Jim Shortlands, the 617 Squadron historian, remembers beside bay number 4.



A modified Lancaster, the B Mk 1 Special, was specially adapted with an enlarged bomb bay to carry the Grand Slam. (IWM)



The opening debut for the Grand Slam was scheduled for March 13 with a split raid on the viaducts at Bielefeld and Arnsberg (in the hilly Arnsberger Wald east of the Ruhr). The attack on Bielefeld encountered bad weather so a follow-up

raid was mounted the next day, March 14. Pilot Officer Heath was again the cine-cameraman, the two stills (above) being taken as the Lancasters encountered flak on the run-in to the target. (IWM)

Pathfinder Force were to lay down proximity marking which, although it was a daylight operation, was considered necessary in view of the expected haze in the area, and one lone Mosquito of 627 Squadron was to carry a camera team from the RAF Film and Photographic Unit, which was to record the first operational drop of the world's biggest bomb. Eight squadrons of Mustangs were to protect the force.

At 1 p.m. on Wednesday, March 14, the two Grand Slam Lancasters were bursting into life at Carnaby. Group Captain Fauquier was running up his engines, testing his magnetos, when there was a crash from the starboard inner and the propellor jerked to a grinding halt as it seized. A connecting rod had broken. Fauquier, muttering with frustration, knew the aircraft would never get off the ground on three engines. There was only one thing to do . . . borrow Calder's aircraft. He scuttled out of his plane and went haring across the field. Calder saw Fauquier's aircraft still at dispersal with one engine stopped, saw the running figure, shouting and waving hands in urgent signals, and guessed what had happened. He promptly banged his throttles open and the Lancaster lurched forward with the small figure sprinting despairingly in the rear. Rolling thunderously down the runway, the Lanc picked up speed till it lifted heavily over the far fence. It was 1.46 p.m.

At about the same time, the fourteen Tallboy-armed Lancasters took off from Woodhall Spa. Falling in behind the Grand Slam plane, their crews watched Calder's wings in wonder and alarm. On the ground a Lancaster has no perceptible dihedral, the wings spread in a straight line, but Calder's wings now were a graceful arc, curving up at



Bomb gone! This particular Grand Slam is falling on the Arnsberg Bridge which proved a tough nut to crack. It needed four attacks and several Grand Slams before success was achieved on March 19. (IWM)

the ends as they took the strain of the 10-tonner. Those underneath could see the great missile hanging in the bomb bays where the doors used to be.

The sky was clear of cloud. The force skirted the flak at Bremen, picked up the line of the railway threading across the plain, and about half past four they all reached the Bielefeld viaduct. The Oboe marking could be seen some 300 yards to the south-south-west of the target. Cloud (or smoke) covered the northern end of the viaduct, preventing a bomb run from north to south.

The Grand Slam Lancaster was one of the first to attack. Calder skirted the target to make an approach from the south. Flight Lieutenant John Benison, the navigator, gave Clifford Crafer, the bomb-aimer, amended settings in double-quick time. Then they settled down for the run in. Crafer switched on the bomb-sight to start a straight and level approach, gave Calder one or two minor corrections, and then released the bomb at 4.28 p.m.

Calder felt the bomber surge up as the Grand Slam fell away. So great was the

The moment of impact at Bielefeld. The single bomb dropped by Squadron Leader 'Jock' Calder demolished over 200 feet of the stonework south of the river. (IWM)



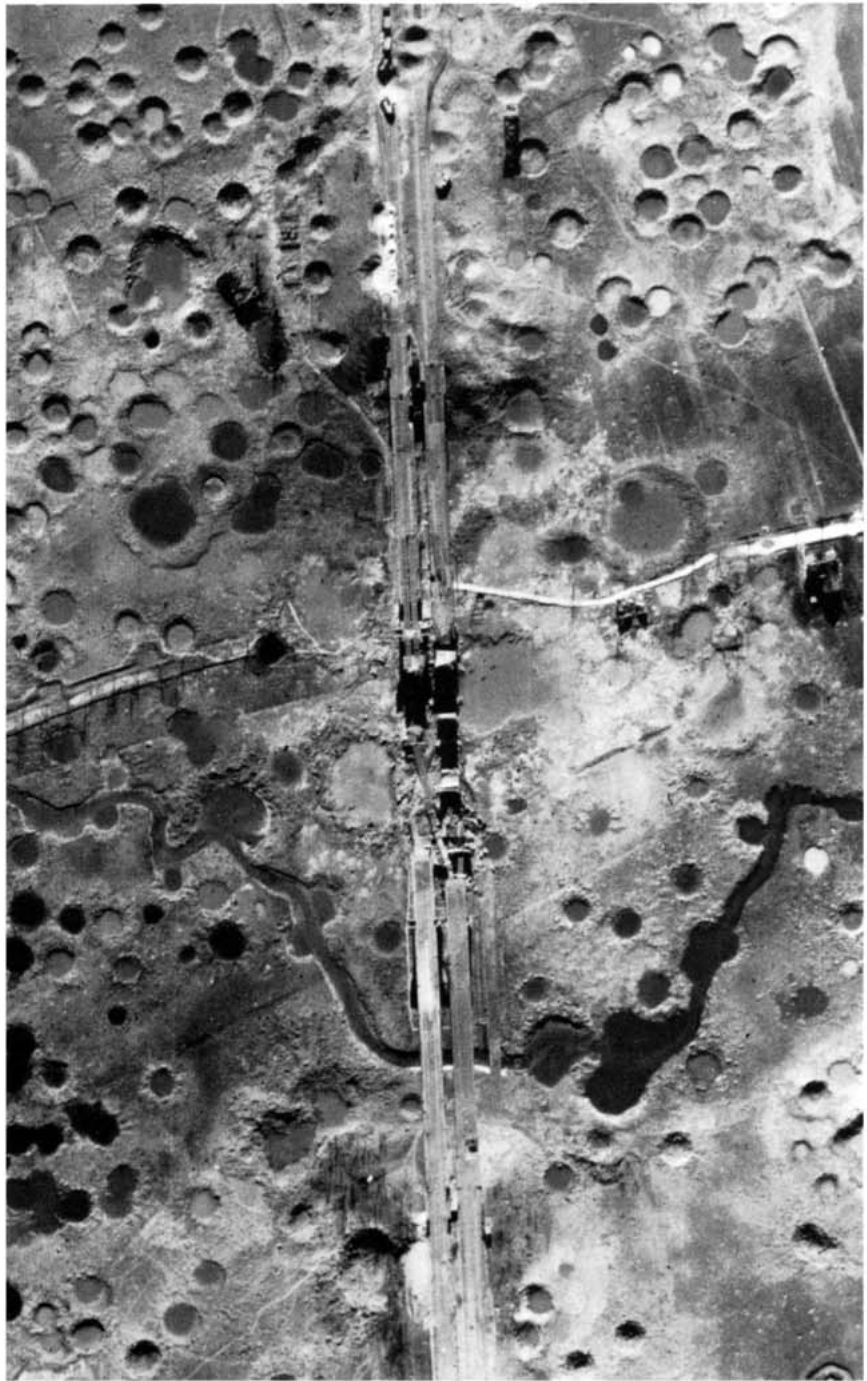
sudden loss of weight that the aircraft rose some 500 feet in height and Crafer shot up from the floor to land again with a thud which knocked the breath out of him. Wheeling away, the crew watched the big bomb drop, slowly starting to spin as its nose dipped lower and lower. Picking up speed, it lunged towards the viaduct. It fell for some 35 seconds and from far above the sharpest eyes picked up the squirt of mud as it speared into the marsh. The crew believed that the bomb had undershot the viaduct by thirty yards but another crew, attacking five seconds later, later reported that the 'Special Stores fell on or very close'. A third crew, which attacked within half a minute of Calder, thought that the big bomb had 'made a very near miss on the southern end of the viaduct' (of course, a 'near miss' was the correct application for the bomb's undermining earthquake activity).

Eleven seconds after the bomb hit earth, the marsh seemed to split and a vast core of mud and smoke vomited up, blowing out 500 feet of masonry while Tallboy explosions erupted along both sides of the viaduct. Because of the 11-second delay, Calder did not see the actual explosion of his bomb, but others did. Suddenly, over his intercom, came a yell: 'You've done it!' It was the pilot of the Mosquito photographic aircraft, Warrant Officer Player, DFC, of 627 Squadron. His cameraman, Pilot Officer Heath, filmed the whole attack from 4.15 to 4.35 p.m. Calder peeled off to try and see what had happened. Slowly the mud settled, the wind wafted the smoke away, and as the target appeared through the veils, Calder saw the viaduct looked like a Roman ruin. Seven arches were missing. He could see almost no stonework lying underneath and thought for a moment that the bomb must have blasted the arches into dust, but could not believe that possible.

In all, eleven of the fourteen Tallboy Lancasters dropped their bombs on or near the viaduct. Some attacked before Calder, but most of them came in after him. Their attacks were extremely accurate and several of the crews claimed direct hits. For various reasons, three Tallboy Lancasters did not attack the viaduct. Flight Lieutenant J. L. Sayers' Lancaster was opening its bomb doors, when the Tallboy just fell off; Flight Lieutenant D. A. Rawes' crew lost their bearings on the run up and dropped their Tallboy by mistake on a crossroads some 750 yards south-west of the target, and Flying Officer D. W. Carey brought his Tallboy back owing to a breakdown in the bomb-sight at the last moment.

All the Lancasters attacked from between 11,000 and just over 13,000 feet at the level of the cloud base. The Grand Slam had been dropped from 11,965 feet, which was much lower than ideal for a penetration bomb to be fully effective.

Photographic reconnaissance showed that the viaduct had been wrecked over a length of more than a hundred yards. Of the twin viaducts, some 200 feet of the northern span and 260 feet of the southern one were destroyed. A direct hit by a Tallboy on the south-west approaches had completely blocked all lines. An enormous crater showed up where the Grand Slam had detonated and, although it proved impossible to distinguish between the effects of the different bombs, no one doubted that the Grand Slam had had an important bearing upon the remarkable result of the raid. The 10-ton bomb had penetrated deeply into the rather soft, water-logged ground on which the viaduct stood, and the shock wave had shivered the arches to breaking point. It seems likely that the explosion had indeed produced a near 'camouflet', blasting an enormous subterranean cavity underneath the arches and that, robbed of their foundations in the mud, the weakened piers had



After the raid, Air Vice-Marshal Sir Ralph Cochrane, commanding Bomber Command's No. 5 Group, wired 617 Squadron: 'You certainly made a proper mess of it this time and incidentally added another page to your history by being the first squadron to drop the biggest bomb on Germany. Good work. Keep up the training. We can't afford to put them in the wrong place.' The Grand Slam crater can be seen just to the left of the demolished spans in this picture taken four days later. (RAF)

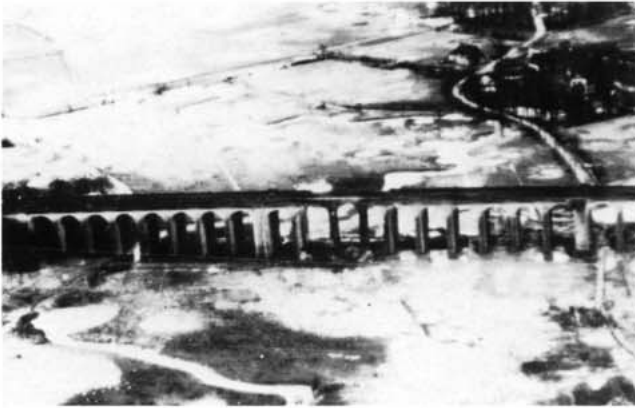
collapsed into the abyss. The Bielefeld raid had completely vindicated Barnes Wallis' theory that a near miss could be more effective than a direct hit.

This was the first of 41 Grand Slams dropped by 617 Squadron on similar targets before the capitulation of Germany. Targets destroyed by Grand Slams, usually dropped in combination with Tallboys, included the Arnsberg Bridge (eight Grand Slams in two attacks), Arbergen Bridge (two Grand Slams), Nienburg Bridge (five Grand Slams) and Bremen Bridge (five Grand Slams).

Johnny Fauquier never really forgave Jock Calder or his crew for stealing the scene, but he was big enough not to take any action and in fact put Calder up for a bar to his DSO.

On the German side, the last raid had again brought casualties and, at the flak gun position near the bridge, about a dozen of the crew had been killed and many more had been wounded. For the people of Schildesche and Brake the destruction of the viaduct came as a relief for, now it had finally been destroyed, it meant an end to the bombing.

The ruined viaduct was overrun by troops of the US 5th Armored Division on April 2, 1945. On May 22, Barnes Wallis was flown out to Germany to visit Bielefeld and, in bitter wind and icy rains, inspected the crumbling masonry of the viaduct he had helped to destroy. He was elated at the 'marvellous bombing'.



Before and after. The low-level oblique *left* was taken on March 5, and that on the *right* on March 17. (IWM)

For years after the war, the wrecked structure of the Bielefeld viaduct remained as a monument to the destructive power of Bomber Command, and nearly 40 years were to pass before the last debris of the ruined bridge were cleared away.

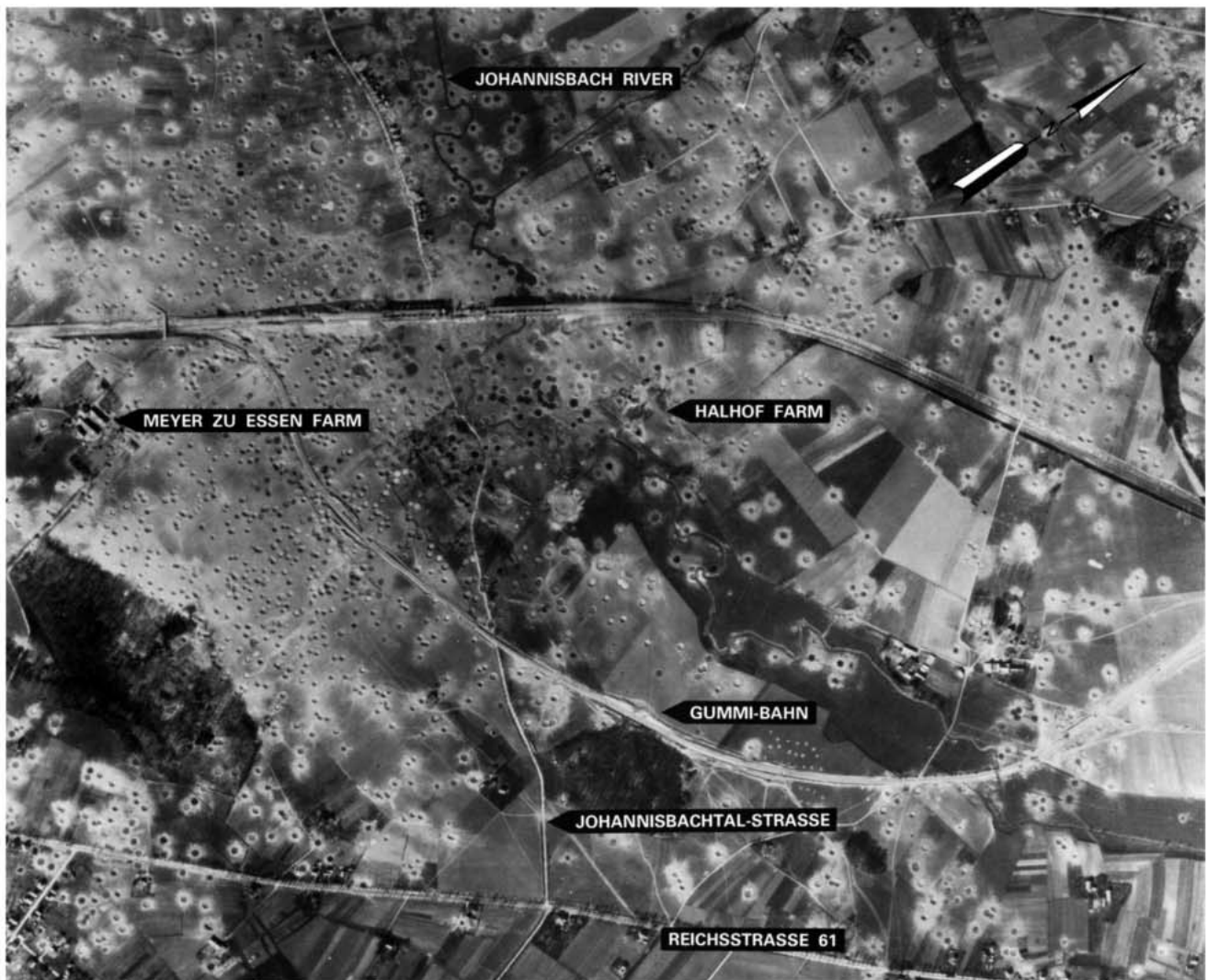
Although a second track had been added to the 'Gummi-Bahn' in the summer of 1945, this was not enough to handle the rapidly recovering train traffic and an emergency solution had to be found. The rail authorities managed to buy a 161-metre length of heavy steel emergency bridge, known as SKR (Schaper-Krupp-Reichsbahn) and originally

produced for the Wehrmacht, and these sections were used to repair the westernmost of the twin bridges. Work was begun in May 1946, the double-track bridge being opened for goods trains in April 1947. Meanwhile, passenger trains continued to use the 'Gummi-Bahn'.

However, this could not go on for ever, for the 'Gummi-Bahn' was a very uneconomical affair. For example, with 120 trains a day, the 3.4-kilometre loop added up to 14,700 extra train kilometres a year. Because of it, three extra railway crossings had to be manned and maintained. The forced reduc-

tion in train speed alone, by making the trip from Bielefeld to Herford 6.10 minutes longer, added up to DM 47,450 worth of extra man-hours per annum — one per cent of what a new viaduct would have cost.

By 1955, the extra expense of running the bypass line had risen to DM 180,000 annually, and it was at that point that the rail authorities first came up with a solution that for years was to hang like a Sword of Damocles over Bielefeld: to bridge the valley by way of a huge dam for the railway line to run over. The railway engineers had calculated that a dam like this would cost only



The lunar landscape shortly before the end of the war. One can count over 2,000 craters on this print alone (covering less than

3½ square kilometres), yet in the end it only took one bomb to bring the viaduct crashing down. (USAF)

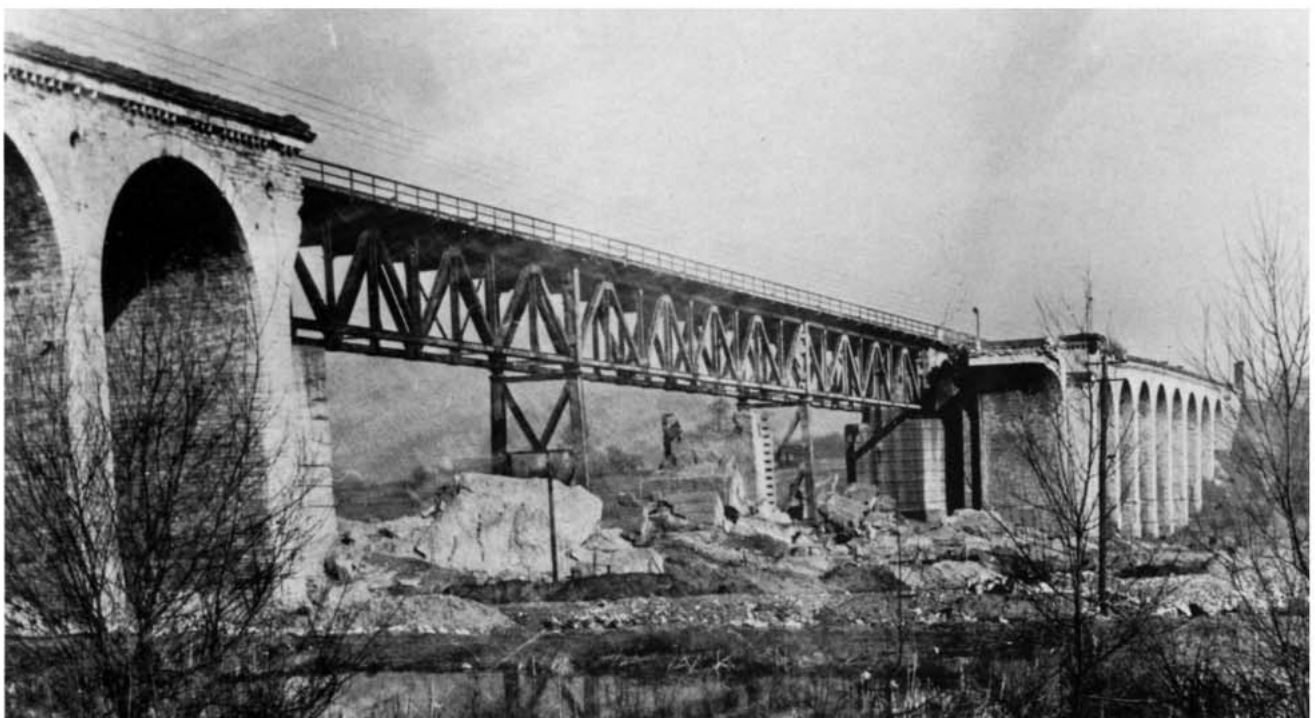
When shown the reconnaissance photographs, Barnes Wallis described the enormous Grand Slam crater as 'exquisite'. Then, two months later, he had the opportunity to view the destruction first hand when he was flown to Germany by Bomber Command. *Right: This picture has been taken from the Schildesche side, showing the south-western face of the viaduct with the crater in the foreground. (IWM)*

DM 2.3 million, whereas a new viaduct was estimated at DM 8.5 million.

As first proposed, this dam would have had a length of 350 metres and would have completely closed the valley. With a height of 20 metres, a width of 80 metres at the bottom and 20 metres at the top, it would have had the dimensions of a true reservoir dam. This first plan was shelved for lack of money, but in 1958 the engineers came up with a cheaper idea: to leave the archways still standing on either side of the gap intact and build a much shorter dam between them — only 160 metres in length, but still 210,000 cubic metres in volume.

The proposal, when it became known, met with vehement protests from the inhabitants of Schildesche. People feared that the necessary realignment of the valley road — a bypass road for Bielefeld — would bring traffic dangerously close to their houses; farmers feared that the dam would create chronic flooding of their fields; others objected that the dam would completely ruin the landscape. The discussion went on for two years, municipal politicians took up the popular outcry, and in September 1960, the Bundesbahn was finally persuaded to drop the Dam Plan. They announced that if the municipality of Bielefeld agreed to pay for clearing the debris still lying under the bridge, they would be prepared to replace the 'Gummi-Bahn' with a proper bridge.

Right: April 1946 — the broken arches are blown up to make way for the construction of a temporary span to bring the westernmost track back into operation. Below: This was built between May 1946 and April 1947 utilising steelwork from an ex-Wehrmacht emergency bridge. In the end, it survived for over thirty years, only being dismantled in 1983. (SB)





Arguments over how best to effect permanent repairs rumbled on for more than ten years, the initial proposal being to build a massive dam along the line of the viaduct on which the tracks could be relaid. Although the Deutsche Bundesbahn engineers subsequently dropped their idea to completely seal the valley,

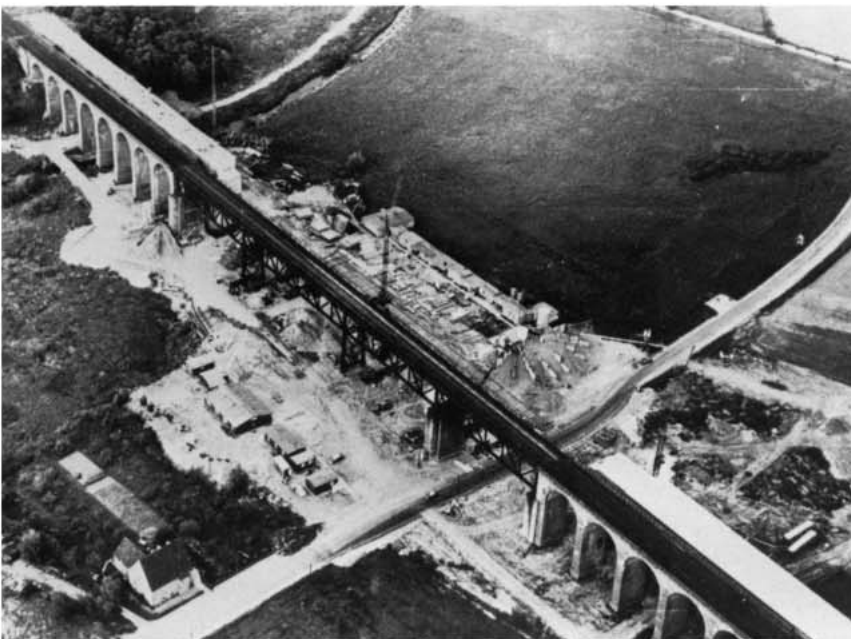
when this artist's impression of their modified plan for a shorter dam was published by the local newspaper, *Freie Presse*, on March 25, 1960, it caused such a public outcry that the Bundesbahn was forced to abandon its 'dam solution' altogether the following September.



Left: Meanwhile, the SKR military bridge soldiered on, this picture being taken from Johannisbachtal-Strasse looking south-east in 1958. (SB) *Right:* In the end, it was decided to erect a rather nondescript pre-stressed concrete bridge along-



side the steel span to bring the eastern tracks back into use. This would at least enable the Gummi-Bahn to be done away with as the temporary expedient was still being used by passenger trains nearly twenty years after the war was over.



Construction of the first reinforced concrete bridge alongside the SKR bridge began in 1962 but first the area had to be cleared of unexploded bombs. This work was facilitated the following year when the Allies made available to the West German



authorities their wartime aerial photographs. With these, consecutive bombing patterns could be plotted and, using the stereoscopic technique, sometimes it even proved possible to identify and pinpoint the location of UXBs.



Left: The first concrete span was completed by January 1964. Here, a goods train crosses the SKR bridge northwards towards

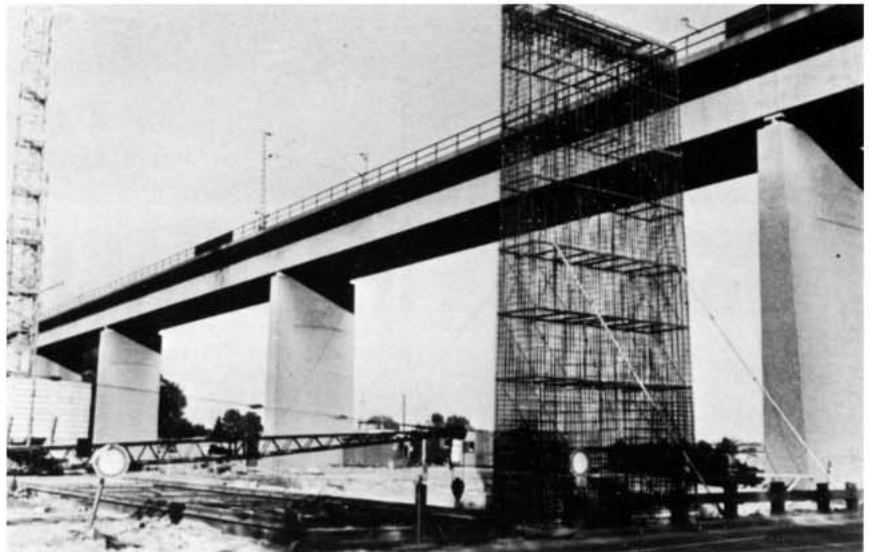


Hanover. (SB) Right: Design-wise, the new viaduct was a poor replacement for the elegant arches of the 19th century.

Work on the new bridge began in 1962. The wartime debris were removed, the shattered piers were pulled down, and the stonework on the intact ones repaired. Three modern piers were erected to support the new bridge, which was to be 160 metres long and of pre-stressed concrete, and another two piers built to connect it with the surviving arches. The bridge was opened in June 1964 and shortly thereafter, the 'Gummi-Bahn', having survived its emergency purpose for so long, was dismantled. (Absolutely no trace of it can be found today.)

Although all four lanes of the viaduct had now been restored, the odd sight of a modern concrete bridge next to an old steel Wehrmacht bridge remained to be seen for many years. Not until 1983 did the Bundesbahn finally decide to replace the steel construction of the goods train bridge with a modern one. Similar in design to the one completed in 1964, it was opened in October 1984.

Yet, today the Bielefeld viaduct is still not entirely free from wartime relics. Of the 3,200 bombs that came down around it during the war, an estimated 12 per cent, or 380 bombs, did not explode and many of them were buried even deeper in the sand by consecutive bombings. It is not known exactly how many UXBs were removed during the war or in the years before 1949, but since then the 'Kampfmittel-Räumdienst' (Ordnance Disposal Service) from Detmold has located and defused over 75 bombs in the



Above: The old Wehrmacht bridge was finally dismantled in 1983 to make way for the construction of a second concrete span. (SB)

immediate vicinity of the bridge and another 100 in the surrounding villages. However, there is no doubt that many still lie hidden in the ground around the viaduct. In 1982, the

Germans flooded the valley to the west of the viaduct, burying for all time the bomb craters on that side, but the outline of craters on the east side can still be detected.



Bielefeld Viaduct, October 1992. In 1970, the old plan was revived to dam the Johannisbach to create a 20-acre artificial lake, the Obersee, for recreational purposes. Before digging

began, a grid search for unexploded bombs was undertaken and numerous bombs found. The lake was completed in 1982 but four more UXBs were found near it in 1984. (D. Wittig)

AFTER THE BATTLE

UNITED KINGDOM



POISON GAS MANUFACTURE IN THE UK

By Major T. I. J. Toler

Poison gas was first used on the Western Front on April 22, 1915 when a greenish-yellow cloud drifted from German trenches between Bixschoote and Langemarck towards positions in the Ypres Salient occupied by French colonial troops. The element of surprise as the gas — in this case chlorine — reached the French trenches added to the fear of a new and unknown form of warfare.

Within ten days, Lord Kitchener, the British Secretary of State for War, had ordered retaliatory measures. He entrusted Colonel Louis Jackson, RE, then employed in the Directorate of Fortifications and Works (the Royal Engineers Branch in the War Office) who was already involved in the study of smoke producers, with the task of exploring the possibilities.

As soon as news of the German gas attack had become known, the Castner-Kellner Alkali Company at Runcorn, Cheshire, had written to the War Office offering their services as they were then the only firm in Britain able to supply chlorine. Also involved at this early stage were Professors H. B. Baker and J. F. Thorpe of the Imperial College of Science and Technology and Sir George Beilby.

The Germans were believed to have employed a mixture of chlorine and bromine, but there was little ability outside Germany to produce the latter chemical. Colonel Johnson therefore concentrated his experiments using chlorine only, while Castner-Kellners instituted measures to increase their current daily output of two to three tons, to ten tons per day.

Under the supervision of Mr A. T. Smith, the first trial at the company's Runcorn plant took place on May 13 with a final large-scale test on June 4. On this occasion, the gas was simply discharged from large factory containers, but Major C. H. Foulkes, RE, was sent to Britain from GHQ in France to devise the size and weight of cylinders required to deliver the gas in the field.

Nothing was known at that time of the methods which had been used by the Germans to release the gas in their attack, but there was no time for further experimentation. The first cylinders were des-

patched to France on July 10 for use in the forthcoming attack planned at Loos in September.

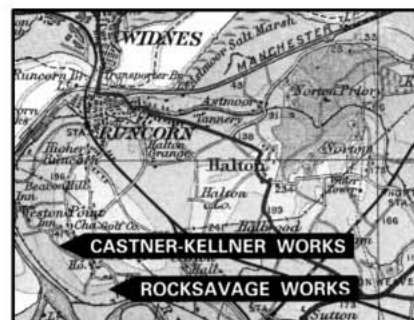
It was estimated that in a moderate wind, a continuous gas cloud would be formed some two hundred yards from the point of emission. As it was desired to have a 40-minute discharge, and each cylinder only lasted for two minutes, 20 cylinders were required for every 25 yards of trench. By September 19, nearly 5,500 cylinders, containing 150 tons of chlorine gas, had reached France, and 8,000 men were involved in the immense task of moving the gas from the railheads to the front line. Each cylinder weighed 120–160lbs

and required three or four men to carry it an average distance of 1½ miles in four long 'carries'. In the event, as only 12 cylinders had been installed to every 25 yards by the eve of the attack, it was decided to turn the gas on intermittently and discharge smoke in between.

Thus, on September 25, 1915, the British Army added poison gas to its armoury and thereafter both sides used the new weapon when weather conditions were favourable.



April 22, 1915 saw the birth of a new horror — gas warfare. *Above:* The Cameronians prepare for an attack. These crude masks were a temporary expedient in 1915. The chlorine cylinders were positioned in recesses dug below the firing step of the front parapet of the fire trench. A flexible copper pipe (replaced later by rubber tubing) connected the cylinder valve to a half-inch iron pipe eight to ten feet long projecting towards the enemy and weighted down with sandbags. British gas was first released on the Western Front at 5.50 a.m. on September 25, 1915. (IWM)



The Castner-Kellner Alkali Company, formed in 1895, had its works at Runcorn, Cheshire, where chlorine was manufactured for gas warfare in the First World War. In 1926 the company was one of the several, including Nobel, the explosives firm, which merged to form Imperial Chemical Industries of which Castners was part of the General Chemicals Division (later Mond Division). It was ICI which led Britain's manufacture of chemical weapons in World War II. *Left:* The Rocksavage Works, adjacent to Castners, was redeveloped in 1939 by the Ministry of Supply to manufacture chlorine and phosgene. (1) Mercury cells for chlorine production. (2) Liquid chlorine production and filling. (3) Phosgene production and filling. (4) Mercury recovery from the chlorine cell anodes. (5) Brine reservoir for cell rooms. (6) Chlorinated rubber production. (7) Medical centre. (8) Office. (9) Fluorine production for atomic energy. (RAF)

The story of the production and the eventual destruction of chemical warfare weapons in the Second World War has not, so far as I know, been told. It was an enormous industrial enterprise, involving the country's largest chemical manufacturer, Imperial Chemical Industries, and was carried out with great urgency and secrecy under wartime conditions.

We must be thankful that chemical weapons were never used but the fact that the United Kingdom had so large a potential with which to retaliate, something which would have been known to the enemy, must surely have prevented them from using it as a first-strike weapon.

It is regrettable but inevitable that the manufacture of certain war gases, namely mustard gas and phosgene, can be carried out in plants such as are used in the dyestuffs and pharmaceutical industries, and it is therefore extremely difficult to ensure that no country is contravening the international convention on the use of war gases.

Mustard gas requires a supply of ethylene which is now produced in enormous quantities from crude oil and natural gas and is used in the manufacture of plastics. It also requires sulphur and chlorine, both common chemicals. Phosgene is also used extensively in the pharmaceutical and dyestuffs industries. Although the reaction processes have to be carefully controlled, and precautions taken to prevent the material affecting the operatives, its manufacture is still very difficult to police under the convention.

I think it is the fear of the unknown which tends to make people so apprehensive of chemical weapons. Thousands of tons of chlorine and phosgene are handled every day and to be caught in a cloud of either gas, if it were released, would be very dangerous, but I have seen a foreman tackle a leaking joint on a liquid chlorine main from which the liquid was running with nothing more than a damp rag stuffed in his mouth whilst he tightened the joint.

Mustard gas burns to the skin are terrible but so are those inflicted by flame-throwers

and napalm. However, mustard gas burns can be minimised if the antidote is available and applied promptly although damage to the lungs and eyes may be permanent.

In 1939, when I was employed at the Castner-Kellner works of Imperial Chemical Industries at Runcorn, in Cheshire, a lot of secret work was going on in some prefabricated

wooden huts next to the main office. Major F. A. Bramwell was the Chief Engineer and W. O. 'Wow' Wright and Jack Boyne were in charge of the project. What follows is only concerned with the war gases contemplated during the Second World War. The biological and binary weapons which were developed later are not discussed.



Rocksavage Plant today, now part of ICI Chemicals & Polymers Limited.

HISTORICAL BACKGROUND

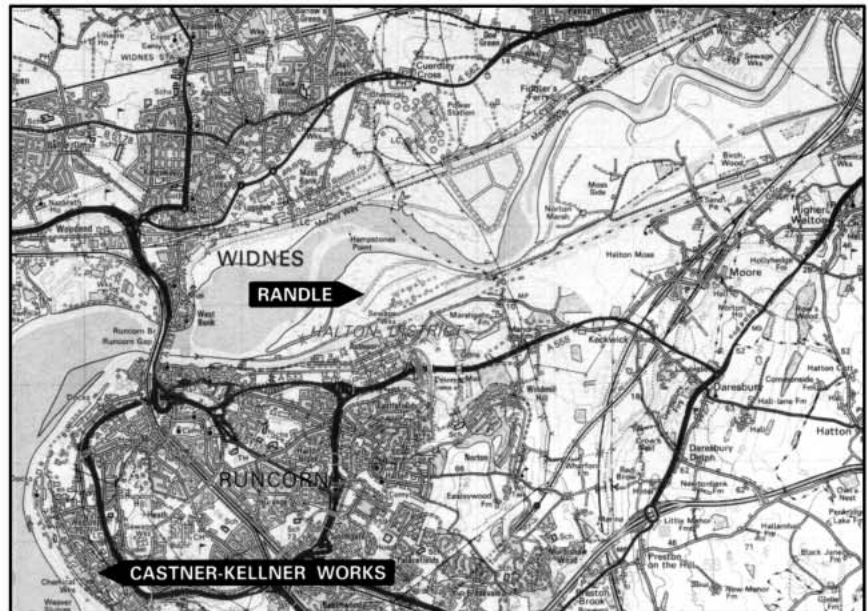
On January 29, 1937, a historic meeting took place at Caxton Hall with Vice-Admiral Sir Harold Brown (Director General of Munitions Production) in the chair, at which Sir Holbrook Gaskell, Dr Alexander Fleck and Dr R. J. Wait represented Imperial Chemical Industries. It was at this meeting that it was agreed that the 'Kemet' site (later to be known as Randle), although not ideal, should be the site for a factory to produce mustard gas. It was also agreed that additional plant to produce the chlorine which would be required would be sited at either Fleetwood or Weston Point, Runcorn (in practice both sites were used). From then on meetings were held at monthly intervals.

In those early days the question was raised as to whether pure alcohol could be used for the production of the ethylene required. This was the preferred method at that time, although Customs and Excise insisted that 'in times of peace denatured spirit, i.e. spirit made unfit for human consumption, should be used'. However, when war was declared this ruling was reversed, though not without argument.

It is interesting to see who were present at these early meetings. For ICI they were Dr Wait, Dr Ferguson (ICI Research Director), Jack Williams (Castner-Kellner Works Manager) and J. M. Jones, and for the War Office: N. K. Johnston, T. A. Smith, Dr F. Roffey, and Dr R. Owen (who later, as director in the Ministry of Supply, remained involved in Randle until its closure in 1960). Later Major Bramwell (Chief Engineer, General Chemicals Division) and Norman Lees also appeared for ICI.

Considerable discussion took place concerning the 1,000-gallon storage vessels on the site. These were to be made of cast iron, enamel-lined with a cast iron lid, the whole covered with concrete blocks with a covering of soil two feet thick. The question of heating the pots in cold weather to prevent the material freezing was discussed and either hot air from paraffin heaters was to be blown round the pots or the space was to be filled with water and steam blown in to warm it.

The disposal of toxic effluent was the next problem. It was agreed that contaminated



When rearmament became a reality, a suitable secure location had to be found for the mass production of Britain's poison gas in a purpose-built government factory, and ideally it had to be close to Runcorn as ICI would be supervising the manufacturing process. One 'green field' site just to the north was Wigg Island in the River Mersey, separated from the town by the Manchester Ship Canal. With a small swing bridge at the western end of the island and a narrow isthmus to the east, access to the factory could easily be restricted. (Ordnance Survey 1988)

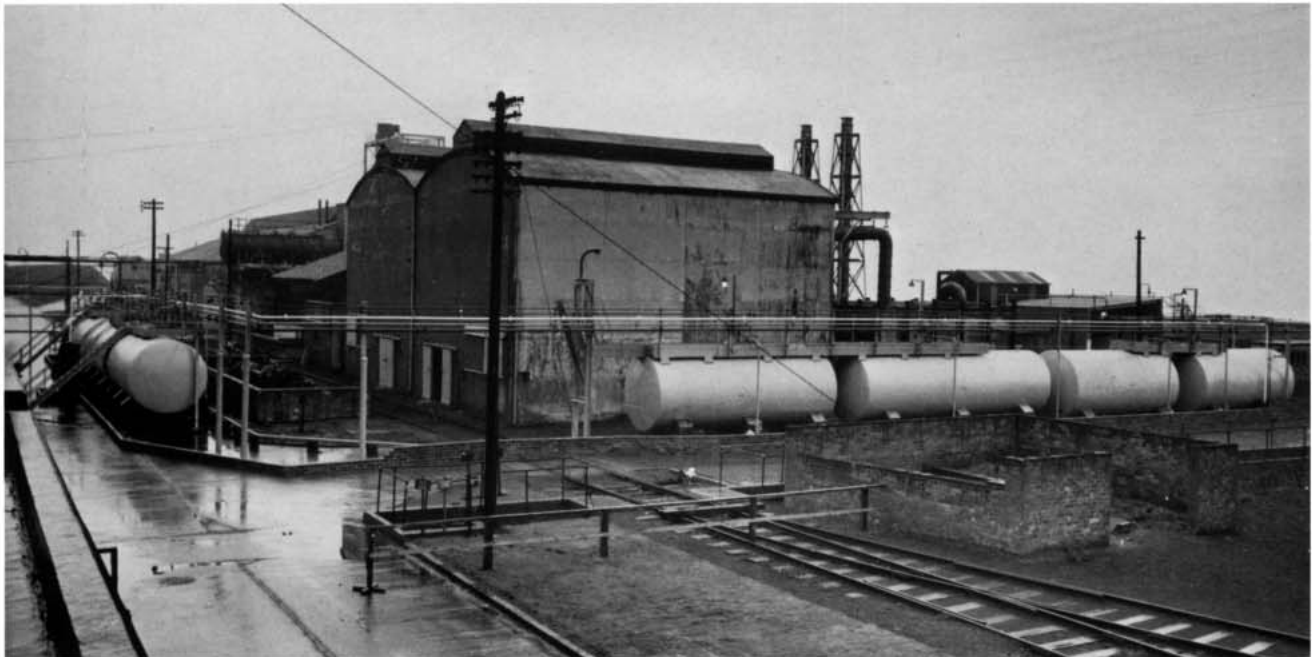
water would be treated in decontamination tanks and afterwards passed into the Mersey. Dr Owen stated that any mustard gas (type HS) remaining in the water would be rapidly hydrolysed (i.e. destroyed). The so-called 'toxic' drain was therefore constructed delivering into the Mersey estuary.

All buildings for production use were to be of ferroconcrete construction — seven inches thick with flat roofs — to give protection from bomb blast.

In August 1937, the use of alloprene (a chlorinated rubber, used for example in the paint for road markings) as a 'thickener' for

the mustard gas and also to make it more difficult to decontaminate was discussed and a requirement of 10 tons per week of alloprene was agreed for use at 5 or 6 per cent in mustard gas (HT) to be known by the code name 'Glue' (HTD).

In September and October, Dr Lamble of ICI and Dr Perren of the Chemical Defence Experimental Station (an organisation which has changed its name several times during its 75-year history) at Porton Down near Salisbury, joined the committee and much discussion centred round the type of containers which were to be filled. In November 1937,



His Majesty's Factory 'Randle' was established on Wigg Island in 1937. At that time our author, Ian Toler, was employed as Plant Engineer at the ICI Castner-Kellner Works in Runcorn and he recalls that 'when one drove along the road by Astmoor, one could see across the Ship Canal strange excavations and large

round cast-iron pots being let into the ground. I think everyone knew it was to be a factory to do with poison gases.' Little did he know that after the war (in which he served with the 56th Anti-Tank Regiment, RA, and later as an Army glider pilot in the Army Air Corps), he would be greatly involved at Randle.

it was agreed that mustard gas production would commence at Randle in February 1938 (later put back to March) and in July came the first mention of a 'casualty' from mustard burns.

In December 1937, the question of lachrymators (tear gases) in particular BBC (bromobenzyl cyanide) was being discussed. Smoke grenades were being filled (probably with DM — a toxic smoke) and in June 1940 500,000 were urgently requisitioned by the War Office. At this time, there was also mention of carbamate (used as a stabiliser for cordite) production at Rocksavage Works.

At the beginning of 1938, as international tension was rising, the problem of security at the factory came up and the names of all staff on the payroll were submitted to the War Office. In August, it had to be decided whether the filling of containers — bombs, shells, etc — should be carried out at Randle or at national filling factories which had all the facilities for handling explosives. In view of the unpleasant nature of the gas, it was decided to build an 'assembly' area at Randle, separated from the rest of the factory, and under War Office explosive regulations. As a result, storage for gunpowder had to be arranged and two magazines holding 10,000lbs of gunpowder were built. The burster charges had to be filled into the appropriate 'bags burster', and both they and the delay mechanism fitted at the factory. As war approached, the fuzes were also fitted and the fuzed weapons stored in trenches outside the filling sheds. The actual fitting of the fuzes was carried out inside the building but the weapon was held in a tube projecting through the wall so that in the event of an accidental discharge the weapon would be ejected outside the building.

PROPOSED USE

When the BEF moved to France in 1939-40, there must have been available considerable stocks of mustard gas bombs for delivery from aircraft. In March 1940, it was proposed by the Air Ministry that in the event of gas warfare starting, bombs which had been used in France should be shipped back to the UK in civil aircraft (Ensigns) for refilling at Randle. The extraordinary suggestion was that they might be refilled 'in the field' using a funnel! The number of casualties suffered by friendly forces through such an idea can only be conjectured.

The RAF considered that 25 per cent of their bombing effort should be for gas delivery, but on May 6, 1940, stocks in France were only sufficient to last one week.



These pictures from ICI files show the buildings in the north-west corner of the factory complex during Major Toler's post-war tenure as Resident Section Manager of Randle, with elements of the mustard gas 'tank farm' in the foreground.

It was known that Germany had a very large potential for the supply of mustard gas and, in the event of it being used, it was envisaged that the RAF would use 1,000lb bombs against objectives in Germany.

When the evacuation of the BEF took place, most of the gas weapons were removed and stored at Harpur Hill, near Buxton in Derbyshire.

In August, when the possibility of invasion was very real, the use of gas was again considered. Lysanders, Blenheims, and Battles of the RAF were adapted to carry 250lb or 500lb bombs or containers for spraying gas onto the beaches if the enemy landed. Stocks of these bombs were stored at Swinderby in Lincolnshire, Barnham Heath in Suffolk, and Lord's Bridge near Cambridge. In fact, in October, trials were carried out with a Blenheim fitted with two 500lb bombs containing mustard gas on an area at Horsham St Faith and West Raynham in Norfolk which had to be decontaminated afterwards. The decontamination of the aircraft and refilling of the bombs was something which required considerable care and personnel had to wear protective clothing.

There was always the chance that Germany would use gas and, although Britain did not wish to use it first, the situation was so serious that a high-ranking officer was reputed to have said 'better to break our word than lose the British Empire' and, as described later, Churchill seriously considered denying certain areas to the enemy by spraying roads and railways, using what came to be called 'chemical lorries'.

Later in 1940, mustard gas was despatched for use in the Middle East for it was felt that the Italians might well use gas, as they had in Ethiopia, therefore Britain's potential to retaliate by spraying was stepped up and trials were carried out in the Sahara. The problem of refilling in the field had to be considered again as it was not practicable to return empty containers to the United Kingdom for refilling.

It was also known that the Japanese had used gas in China so the ability to retaliate involved sending stocks to Malaya, in particular toxic smokes and mustard gas sprays. It was also considered that if Britain's potential to produce gas at home was impaired, facilities for the production of mustard gas in South Africa should be considered.



The sole factory building remaining on the site today which is now known as the Randle Island Landfill Site.



Nearby stands the old sub-station, the only one of the original reinforced-concrete buildings to have survived.

PRODUCTION AT RANDLE

Mustard gas is, to give it its correct chemical name, dichlorodiethyl sulphide. At normal temperatures it is a liquid rather like diesel oil in appearance with an odour akin to garlic. (If you happen to be in a wood with wild garlic you might well think you were being contaminated by it!) Its use as a war gas is because it is a 'vesicant' which means that contact with the liquid or vapour will cause blisters on the skin similar to third degree burns, and if inhaled will cause serious damage to the lungs which will almost inevitably cause death. Its value as a war gas is due to its persistence — it does not readily decompose and will remain active in the ground or on materials it has contaminated for many days, in fact months or even years. This makes it completely different from the effects of chlorine or phosgene which, as gases, are readily dissipated in the atmosphere.

It is comparatively easy to manufacture, given a supply of the raw materials which are mostly readily-available chemicals, and there are really only two effective ways of decontaminating mustard gas. One is by the application of bleaching powder and the other by burning.

There are two types of mustard gas. Runcol (HT) which is produced by the method used by the Germans in the First World War of reacting thiodiglycol (known as 'Syrup' for security reasons during the war) with hydrochloric acid, and Pyro (HS) which is produced by combining ethylene with sulphur dichloride. Runcol was more expensive to manufacture and was not suitable for tropical storage. As the Syrup plant

could readily be converted to make ethylene glycol — the coolant better known simply as 'Glycol' used in aircraft engines — after the priority for war gases was reduced in 1942, considerable quantities of Glycol were produced instead.

The manufacture of Pyro required large quantities of ethylene and in those days the preferred method of manufacture was from ethyl alcohol. Pure ethyl alcohol (the basis of whisky and gin, etc.) is strictly controlled by the Customs and Excise and for industrial use it must be denatured to make it unfit for human consumption. However, to use denatured spirit in the manufacturing process required the plant to be made of a precious metal such as silver to overcome the problems of corrosion. Therefore, after considerable negotiations, the Customs and Excise agreed to allow pure spirit to be used under strict control. I don't remember any stories of process workers being under the influence but it must have been a great temptation when there was any form of a 'spillage' which must have occurred on occasions.

There were several forms of Pyro. These were mixtures with various solvents including benzene which were used to lower the freezing point and to make the material more readily absorbed through the skin. (Benzene was also explosive and this caused a serious incident which will appear later.) In order to store the Runcol and Pyro manufactured at Randle, a hundred cast-iron pots of five-ton capacity were sunk into the ground and dispersed over the whole area as a protection from air attack.

As well as the production and storage of mustard gas, provision was also made at

Randle Works: (1) Boiler House No. 1. (2) West Field — 5-ton enamel-lined pots buried in ground for storage of mustard gas. (3) Decontamination area and burial pit. (4) Joiners, fitters and electricians shops. (5) Huts loaned to ICI for metal degreasing project. (6) Ethylene Plant No. 1. (7) Runcol manufacture (mustard gas). (8) Air scrubbing plant and ventilation chimney. Used later for the VD (vesicant destruction) programme. (9) Glycol Plant. (10) Ethylene Plant No. 2. (11) Laboratories. (12) Office. (13) Canteen. (14) Medical Centre. (15) Boiler House No. 2. (16) Boiler House No. 3. (17) Pyro production (mustard gas). (18) Changing room and contraband control for entrance to the explosives area known as 'The Assembly' with timber walkways where special clothing was necessary — no cigarettes, matches, etc. This area was surrounded by a ring fence. (19) Changing room for dressing and undressing in FPC (Full Protective Clothing). (20) Charging buildings and storage trenches for shells, etc. (21) Charging building for fitting explosive charges to shells. (22) Fitting burster charges into shells. (23) Charging buildings. (24) Incinerator — used for decontamination of heavy equipment. (25) East Field with 5-ton pots as for West Field. (26) Building K1 — for filling and storage of 1,000lb bombs. (27) Building K2 — for filling and storage of various shells and weapons such as the 'chemical lorries'. (28) Building K3 — as K2, but used for the storage of titanium powder in the 1950s. (29) Railway. (RAF)





Randle for the charging of weapons in what was known as the Assembly Area, which has been referred to previously, controlled under strict explosives regulations. The Charging Buildings K1, K2 and K3 were used for filling weapons with mustard gas. At first, 3.7-inch and 6-inch shells, 30lb and 250lb bombs and drums were filled, and later 5.5-inch and 25-pounder shells and 500lb bombs and stoneware bottles (for training purposes).

The most unusual container was called a 'chemical lorry'. They were not really lorries at all but tanks mounted on wheels which could be towed behind any vehicle and were fitted with a spraying device so that the contents could be applied to the ground behind them — rather like the tar-spraying equipment used in road-making. Their official title was Bulk Contamination Vehicle (BCV) or Installation Type A/LP — a pressure 'water' cart containing 126 gallons of mustard. Some versions were lorry mounted.

In 1940, when the threat of invasion was considered very serious, it was planned that these tanks — and I am told there were hundreds of them — would be taken to the area where the enemy had landed to spray the mustard gas on the roads and railways to inhibit his movement inland — a 'scorched earth' policy if ever there was one. Presumably, the civilian population would have been evacuated but what would have happened afterwards can only be conjecture. It sounds a most extraordinary story but the filling of these containers has been officially recorded and Winston Churchill noted his own feelings of 1940: 'The possible use and counter-use of poison gas, if invasion should come in the New Year, weighs heavily upon me.' So it may be that this counter-measure was considered to be a serious possibility.

In a memo to the Ministry of Supply in December 1940, Churchill complained that the bulk storage for 2,000 tons of mustard gas was not ready and, whilst the filling of 25-pounder shells had begun, the new 6-inch shells had not been filled. And again in August 1941, he said to Lord Cherwell: 'We must expect gas warfare on a tremendous scale. It may break out at any moment.' He also complained that the Air Ministry had stopped charging 250lb bombs. Churchill obviously took the possibility of gas warfare very seriously.

Some of the early methods considered for delivering mustard gas were almost 'Heath Robinson' in their context. One was to use thin-walled metal containers which would be dropped from aircraft and which would simply burst on striking the ground like a bag filled with water. Experiments were carried out from the tallest building at Randle to ascertain how thick the walls of the container should be so that they would not collapse during transport but would burst readily on striking the ground. A simulated filling was used in place of mustard gas!



Five-ton tanks of mustard gas on the railway spur leading to the main line. A consignment of this size (over 250 tons) was probably either coming from or going to the underground storage complex at Rhydymwyn (pronounced Rid-dermowen) in North Wales (see page 22).



Our comparison is taken from the extreme eastern end of the site, now used by ICI for the disposal of waste products.

As well as the production and storage facilities at Randle there was, as has been described, an area, strictly controlled under explosive regulations, for assembling the shells and bombs after they had been filled

with their explosive charge and detonators. At first, the detonators were not fitted but later on they were. This caused a serious incident which could have had very grave consequences. For some unknown reason, a



The original gates for the side-by-side road/rail entrance at this end of Randle still remain. Nearby is the old guardhouse.



The railway track has been lifted, but the bridge taking the line over the road to Moore still stands.

shell ignited without exploding but the girl who was filling at the time, with great presence of mind, carried the shell outside the building where another operative made it safe, for which action she later received an award.

In addition, the area was used for producing smoke generators and smoke grenades filled with a carbon tetrachloride composition and also grenades filled with arsenical smoke.

The factory was in the charge of the works manager, R. P. 'Bob' Littler, much loved and respected by all personnel, and at the peak of production he employed over 3,000, many of them women who worked alongside the men on the dangerous job of producing and packing vesicants.

Jack Boyne was the works engineer and after the war he told me the following story which illustrates the dedication of the workers at Randle during the war.

'The main toxic outfall from the factory was a 12-inch earthenware pipe roughly 12 feet down in soft newly-made ground', explained Jack. 'The toxic settling pits in the plant had a capacity for six to eight hours running — after that everything depended on the main taking the contents to the river.'

'About five o'clock one afternoon, the glad

tidings came that the pits at the plant were filling up which indicated that the toxic main was either being choked or had collapsed. Clearly production was going to stop some hours hence if the main was not cleared. Normally this would have been a three or four-day job. As things happened, most people, office staff and most of the managers at any rate, had gone home by the time the seriousness of the situation was appreciated.

'Full safety precautions were instituted and the locating of the faulty section of the sewer was carried out in full protective clothing (FPC). Old Joe Savage was put in charge of safety. The site was roped off — long breathers and every conceivable type of gas mask were prepared — and drums of bleach for decontamination were brought to the spot. Air Raid Precaution lighting for an all night job was prepared, and every man we could lay our hands on was held back before he nipped on a bus and warned to be ready to do some digging.

'By eight o'clock or so we were beginning to make some impression on the excavation using relays of men each doing half an hour or so of pretty energetic digging in FPC. The canteen had been instructed to prepare emergency snacks for the gang and at this

stage I thought I would go down and have some tea. Joe Savage was left mounting guard over the approaches to the suspect area and forbidding anyone near the scene of the trouble unless fully protected.

'I suppose my tea took forty minutes or so before I wandered back to the job. Drawing near, I sensed that something was up. I felt certain of this when I came across Joe, a completely honest old chap, but now looking tremendously unhappy, uncomfortable and decidedly guilty. But guilty of what? I didn't have to look very far. At the bottom of the hole, wearing only shirt and trousers and with the top of his gum boots occasionally disappearing under the level of the liquid mud at the bottom of the excavation, was the worthy Frank Hall, then the yard general foreman. Frank was shovelling sloppy mud and earth into a staging above him where one Jack Comber, also suitably attired in open neck shirt, etc., caught what he could off of Frank's shovel and heaved it on to the edge of the hole where someone else — Ned Spencer I think — pushed it to one side. Because the bottom of the hole was liquid mud, each shovelful splattered a great deal back into the hole and covered anyone close by with muck which was likely to be highly toxic.



Left: On the bank of the Ship Canal lie the remains of the concrete structure which can be seen beside the discharge point on the aerial picture on pages 16–17. Right: The sluice for the cooling water which discharged into the canal. Major Toler comments 'both from the record and from my personal knowledge, Imperial Chemical Industries has always attached the greatest importance to safety and the protection of the

environment. However, in wartime, certain practices, in particular the passage of treated toxic effluent into tidal water, were allowed, something that would be totally unacceptable today, although at the time it had no apparent deleterious effects. It may well have been that their record in handling dangerous chemicals with safety made ICI the obvious choice for the manufacture of war gases.'

Chlorine was also supplied by the Hill-house plant at Fleetwood in Lancashire. Brine was taken from the wells at Preesall (a district east of the River Wyre) and converted to chlorine and caustic soda by electrolysis. Today the same building (1) is used by ICI to produce chlorine, with hydrogen and hypochlorite (bleach) as by-products. Some of the chlorine is now used to produce vinyl chloride and the remainder for making methylene diphenyl di-isocyanate in the phosgene plant. Building (2), in which production began in 1942, was demolished in 1985.

'I then realised how Joe Savage was feeling, because I was feeling exactly the same — very guilty and very unhappy indeed — but what did one do? Did you order the men out, send for the doctor, or what? Frank Hall gave me a clue by saying with a big grin "There's no bloody good worrying now — if we are bloody-well toxic, we are toxic now and you might as well leave us alone for another hour with the job." I'm afraid, with one or two minor precautions I then took chiefly for the benefit of the bystanders, I did what Frank recommended: left them to get on with the job.

'Afterwards they explained that they could see it would have taken all night wearing FPC and the plant would have to be shut down long before then if they continued with full observation of safety regulations. When I pushed off for tea, they therefore decided amongst themselves to tell old Joe to take a walk so that he wouldn't be implicated, before chucking off their clothing, and proceeding to practically bathe in the stuff. It was one of those occasions when the output of material from Randle was considered of rather greater importance than their own safety and, in their own way, this was their contribution to the war effort.

'As it happened all was well. We found several broken sections of the pipe, replaced them and the job was finished about 10.30 p.m. Everyone had a shower bath and hoped for the best before going off to an unofficial extension of licensing hours at the first pub we came to. There were some anxious moments next morning and I, at any rate, was mighty relieved to find that no one was suffering from burns or any other injury.

'I don't believe any other member of the staff really knew what was done that night', recalled Jack years later. 'Bob Littler, as works manager, would have blown up if I had told him and Jack Smith, the safety officer, would have passed away altogether! But that was Randle in those days.'

Frank Hall really deserved a BEM for his



work that night but unfortunately he couldn't even be given a word of thanks or congratulations next day because as a foreman he had wilfully broken safety rules.

During 1943-44, production at the factory ceased and thereafter personnel had nothing to do except keep the plants in readiness for manufacturing to start at twenty-four hours notice. Because it had taken so much time and effort to train operatives, both men and women, the management were loath to stand them off when production stopped and most were kept on, albeit with probably little to do. The story is told that one night the works manager who visited the plant at unusual hours passed a couple of girls and offered them a lift. He asked them where they worked?

'Randle,' they replied.

'How do you like it there,' he said.

'Oh fine,' they replied, 'we're on the Syrup plant. It's a cushy job. When we've finished there's a fine place behind the receivers, nice and warm where we can finish the shift.'

They never knew who had given them a lift and he never let on that he knew what was happening.

Probably because there was so much time spent on waiting for production to recommence, there was plenty of time for social activities. The annual children's Christmas party was a great event yet it required a lot of voluntary effort and dedication on the part of those who ran it. It also gave a great deal of pleasure to very many children who otherwise in wartime would not have had much



Left: Wade Works, on the eastern outskirts of Northwich (ten miles south-east of Runcorn), was another ICI plant used in the poison gas programme. It produced allopren (chlorinated rubber) to thicken mustard in building (1) with chlorine cells in (2). Building (3) produced bleaching powder. (RAF) **Above:** The latter cell rooms have since been demolished. (ICI)

opportunity for fun. The workshops, the joiners and the painters produced all sorts of gimmicks for Father Christmas to arrive in, and every child had a present although toys were not easy to come by. Not to be outdone, the canteen always produced a magnificent 'feed'.

Not unnaturally, there were other 'social' activities, inevitable under wartime conditions in the black-out in a factory with a mixed labour force. On one occasion, a girl was sent on an errand but after several hours it was suddenly realised that she had not returned. A full-scale alert and search of the whole factory was instigated. This eventually revealed a cupboard in one of the laboratories which was just large enough for two people to squeeze in if they were very close together — which they were!

OTHER MINISTRY FACTORIES

In addition to Randle, other Ministry factories had to be commissioned partly to produce the raw materials required for the production of war gases but also to increase the productive capacity for the gases themselves.

ROCKSAVAGE WORKS

Another ICI factory situated in Runcorn, Rocksavage produced chlorine, bleaching powder (used for decontaminating mustard gas) and phosgene. The phosgene, to be used as a potential war gas, was filled, as a liquid under pressure, into 25-pounder shells, 4.2-inch mortars, 250 and 500lb bombs and naval shells.

WADE WORKS

This ICI factory, situated at Northwich, produced chlorine and bleaching powder and alloprene (chlorinated rubber).

ROYD MILLS

Prior to the outbreak of war, the intermediate for mustard gas had been made at the Dalton works of ICI's dyestuffs division near Huddersfield. Royd Mills was sited half a mile south-west of Dalton works and was originally used for the production of glycol, similar in composition to the intermediate thiodiglycol for mustard gas.

SPRINGFIELDS

This site lay six miles west of Preston. It had two production plants designed for a total of 600 tons of vesicant per week. There was also storage capacity for 65 tons of Lewisite (another vesicant based on arsenic) or Larmine (bromo benzyl cyanide — a strong lachrymatory liquid). There was also a project for filling incendiary bombs.

HILLHOUSE

An ICI plant near Fleetwood used for the production of chlorine for use at the other factories.



Springfields. This important chemical weapons plant was located just west of Preston in Lancashire. Technically, it was a Ministry of Supply factory operated by ICI. In 1946, it was the first site to be established under Britain's atomic energy programme, and the first uranium ore concentrates were sampled here in 1948.



Today the plant is operated by British Nuclear Fuels Plc manufacturing fuel elements for the nuclear generating industry. A few of the wartime buildings still survive.



Royd Mills, on the other hand, has been completely demolished. It lay just across the River Colne in Huddersfield



close by the town's football club ground. ICI retained ownership of the derelict site until it was sold to Kirklees Council.



The entrance to the former top secret poison gas complex of Valley Works in the county of Flint (now Clwyd) in North Wales. Based around the old Bryn Celyn lead and zinc ore mine



abandoned in 1919-20, its workings were subsequently taken over by the Ministry. Evidence of its wartime use can still be seen with camouflage paint visible on many of the buildings.

STORAGE

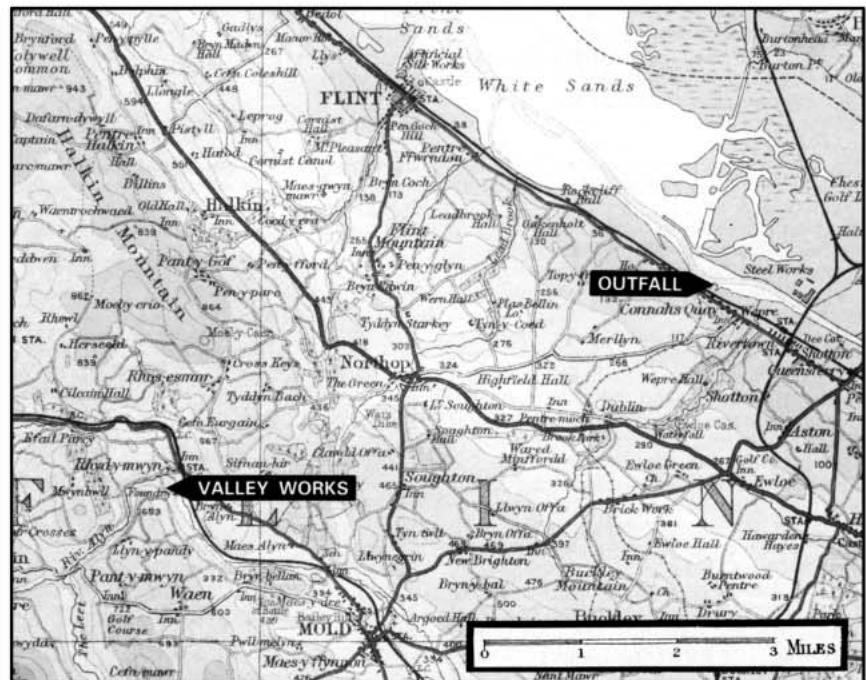
By the end of 1938, it had been realised that storage capacity would be required for the large quantities of mustard gas which were to be produced. It was decided that this would be accommodated at Valley Works, located in a complex of tunnels to be cut out of the solid rock in the hillside at Rhydymwyn, 2½ miles south-west of Mold in North Wales. The site covered 90 acres and, with 130 feet of rock above, it was said to be proof against all bombs known at the time.

Construction work began in October 1939. There were four chambers and three entrance tunnels. The chambers housed 78 mild steel, lead-lined storage tanks of 55- and 65-ton capacities. There was a powerful ventilation system and the entrances to the tunnels were controlled by electrically-operated steel doors. The contents of the tanks could be transferred to rail tankers by a series of pipes and pumps to a loading gantry outside the tunnels.

In building the tunnels, it was necessary to divert the River Alyn into a concrete culvert. This was designed for the worst flood conditions known at the time. However, freak conditions occurred shortly after completion, causing the tunnels to be flooded and the culvert had to be rebuilt.

The effluent from the factory had to be pumped six miles through 12- and 15-inch pipes, to the River Dee where the outfall had to be piled to support it in the mud of the estuary.

Not only was Valley used for storage of vesicant, but it also had plant for its manufacture as well as for charging weapons, and in 1941 the output of mustard gas was 266 tons per week.



A railway spur from the works joined the line which ran through Mold and thence to the Midlands. Below left: Although the River Alyn ran through the site, and was diverted through a culvert running beneath the mine, a separate toxic drain was installed to take effluent direct to the River Dee near Connah's Quay. A massive ventilation system for the mineshafts, which were used for the storage of poison gas, was installed outside the main entrance. This equipment has since been dismantled leaving only the concrete foundations (below right).





Three entrances led into the old mine tunnels. *Above left:* This is the central one beside the ventilation plant. *Above right:* Air raid shelters still stand on the hillside. *Right:* Rail tankers containing Y3 — mustard gas — photographed at Valley Works in 1957. In the centre the site foreman, Ted Johnson. It was during the Cold War period that the site at Rhydymwyn was subjected to much speculation by the Campaign for Nuclear Disarmament who believed it to be the location of a secret government bunker for use in time of nuclear war. Valley Works certainly had a connection with atomic bombs, as it was here that early British experiments were carried out for an isotope separation plant for the purification of uranium. When it became obvious that wartime Britain lacked the huge resources which would be necessary to produce an atomic bomb, the emphasis shifted across the Atlantic to America (*see issue No. 41*) although experimental work continued in Wales throughout 1942 and 1943. Finally, in an effort to dispel the rumours, Harlech Television was permitted to inspect the site in 1982 when journalists were shown the empty tunnels. Nevertheless, as late as 1986, local CND activists were still suspicious, although such fears have largely melted away with the ending of the Cold War. The concept of *unilateral* nuclear disarmament, which was such a focus of attention during that period, was put to the test in 1956 when the British government unilaterally gave up an offensive capability in chemical weaponry. In the event, the 'go-it-alone'



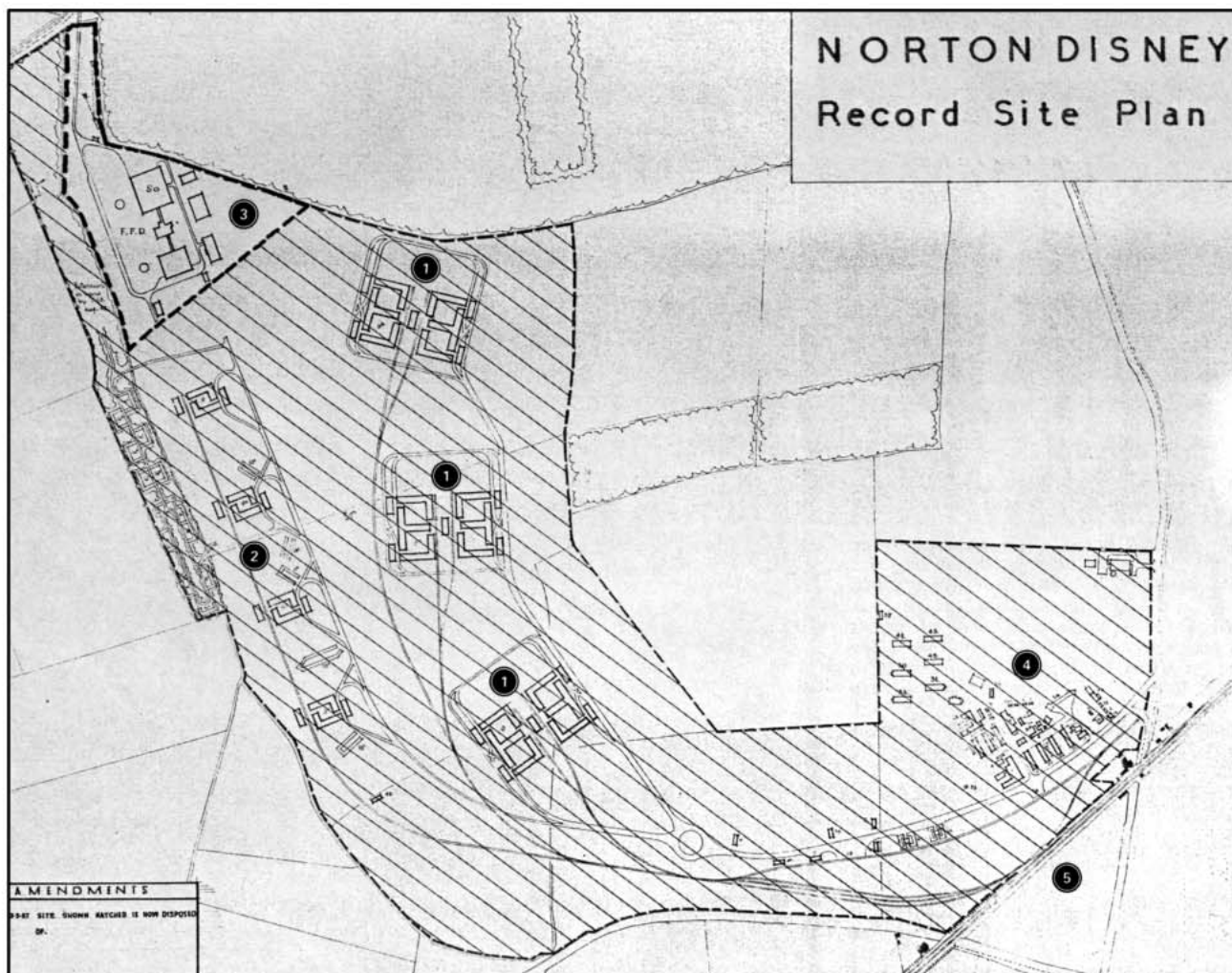
decision did not encourage other nations to follow suit; in fact it is now known that after the signing of the Biological Weapons Convention in 1972, the Soviet Union actually *increased* its manufacture of such weapons! Poison gases re-emerged in war in Afghanistan in 1980-82 and mustard gas was used by Iraq against Iran, the Turks and the Kurds, from 1983-89. (Whether agents such as 'Yellow Rain' (a myco-toxin) used in Laos

and Cambodia, or 'Agent Orange' (a defoliant) in Vietnam, can rightly be classed as chemical weapons is open to debate.) A new Chemical Weapons Convention opened for signature on January 13, 1993 as a back-up to the 1925 Geneva Gas Protocol, for whereas the latter outlawed the 'use' of poison gases, the 1993 treaty is intended to ban the manufacture and stockpiling of such weapons.



Today Valley Works comes under the auspices of the Ministry of Agriculture, Fisheries and Food and is used as a buffer food depot. Several of the larger warehouses are used for the storage of bulk supplies of flour and sugar as well as feeding equipment to be brought into use in times of emergency. The conditions of our visit to the depot were that photography was

not permitted of any buildings holding stocks, or of the tunnels which, in any case, are all now empty. *Left:* Apart from the old wartime buildings, many of which have now been vandalised, the most pertinent reminders of the former rôle of Valley Works are several toxic waste burial pits, the extent of each being indicated by inscribed concrete markers (*right*).



The next step in the factory-to-end-user chain were Forward Filling Depots. Although aircraft bombs were filled at Randle and Valley, bombs and liquid mustard were also stockpiled nearer to the airfields which would need the supplies. There were five primary FFDs although many other locations associated with chemical weapons figure in the organisation charts of the period, including Bowes Moor, Durham; Southburn, Acaster Malbis and Escrick in Yorkshire; Brafferton, near Ripon; Harpur Hill, Derbyshire; Longparish in Hampshire; Kiplin in Yorkshire,

and Spalford near Swinderby. *Above:* A typical Forward Filling Depot controlled by No. 93 Maintenance Unit at Swinderby in Lincolnshire. Located alongside Swinderby railway station, the first 1,000 chemical bombs (250lb) arrived in 20 lorries from Randle on November 12, 1939. Personnel from the Chemical Defence Experimental Station at Porton Down, Wiltshire, inspected the site in May 1940 and in October that year it was officially renamed Norton Disney. (1) HE storage. (2) Incendiary storage. (3) Mustard gas tanks. (4) Camp site. (5) Railhead.

FORWARD FILLING DEPOTS (FFDs)

In addition to the facilities at the Ministry factories, filling depots were constructed at sites selected by the Air Ministry. In all there were five: Nos. 1 and 2 controlled by the US Army Eighth Air Force Service Command and the remainder by the RAF.

No. 1 BARNHAM HEATH

Located 3½ miles south of Thetford, it had underground storage for 1,500 tons of mustard gas and facilities for filling spray tanks and 65lb bombs.

No. 2 MELCHBOURNE PARK

Situated 9½ miles north of Bedford, it had similar facilities to Barnham Heath.

No. 3 SWINDERBY

Confusingly described as being located at Norton Disney (a village 8 miles south-west of Lincoln), it was in fact sited close to the Bomber Command airfield at Swinderby. It had storage for 500 tons of mustard gas and facilities for filling 65lb bombs.

No. 4 LORD'S BRIDGE

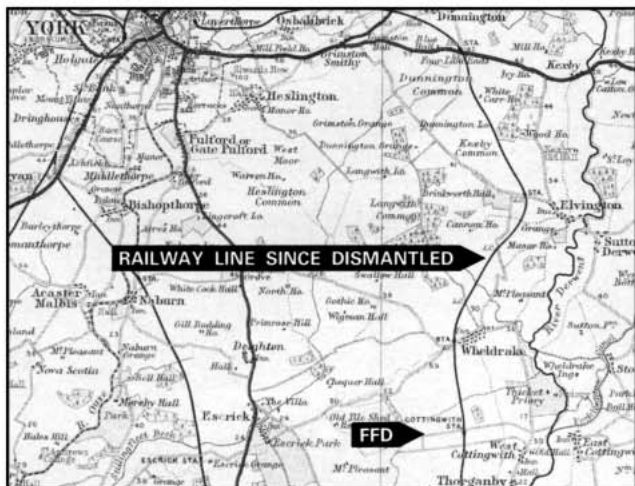
Located 5 miles south-west of Cambridge — similar facilities to Swinderby.

No. 5 WEST COTTINGWITH

This FFD was located 8 miles south-east of York with similar facilities to the other RAF sites.



The Forward Filling Depot at Swinderby remains largely intact, save for the removal of the underground mustard tanks. (See also centre pages.)



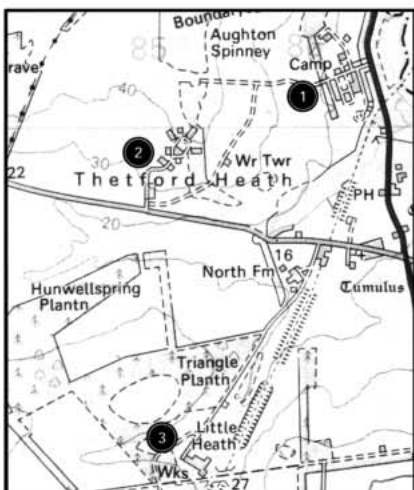
No. 5 FFD was established just south-east of York in the centre of a whole swathe of Bomber Command airfields. Rail access was essential to all the depots and West Cottingham was no exception, the bomb dump being situated just beside Cottingham station (left). Today the railway has long gone, but the

underground storage tanks or mustard 'pots' remained in situ on fenced-off Ministry of Defence property on the Thorganby estate right up until 1991 when the tanks were dug out and the site levelled (right). A few of the old wartime buildings still survive.



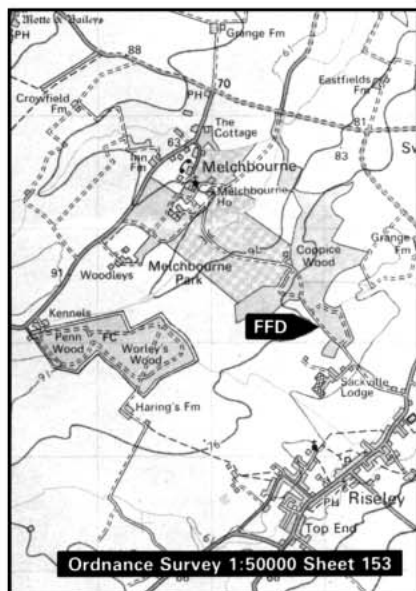
The US, which had not at that time signed the 1925 Geneva protocol on the use of gas in war, established chemical depots at Sudbury, Derbyshire; Cinderford, Gloucestershire; Moneymore, Northern Ireland; Sudbury, Suffolk; Barry, Glamorganshire; Hilsa, Hampshire; Westbury, Wiltshire; Histon, Cambridge; Shepton Mallet, Somerset, and Loton Deer Park, Alderbury, Shropshire. Meanwhile, two FFDs (which the Americans referred to as Advance Chemical Parks) at Melchbourne Park near Rushden in Northamptonshire and Barnham Heath in

Suffolk were handed over to the Eighth Air Force under reverse lend lease. The RAF mustard installation at the latter depot was located west of the HE bomb store (1) just off the Elveden to Barnham road in Exclamation Spinney (2) but this disappeared with the post-war construction of a nuclear weapons' store (above), now the Gorse Industrial Estate. Below: The Americans were given the satellite site located a mile to the south in Triangle Spinney (3) which was closed and decontaminated in 1954 although the mustard pots were not removed until 1991.









POST-WAR

At the end of the war, it must have been decided to destroy at least part of the stocks of mustard gas which were stored at Randle and Valley Tunnel Storage. Between 1945 and 1947, mustard gas from Valley (and, I have been told, possibly from the FFDs) was loaded into tank wagons and transported to Stranraer and Cairn Ryan where the tanks were loaded into Liberty ships which were then scuttled, complete with tanks containing the mustard gas, presumably in deep water beyond the Continental Shelf.

Peter Woodward, the chemist in charge of the Valley Tunnel Storage, was responsible for the trains and recounts one story that during the passage through the north of England, one of the tanks was found to have a small leak. He therefore ordered that a length of track be torn up and the sleepers burnt, although history does not relate what the railway and travelling public thought!

However, this early decision to destroy the gas must have been countermanded because, for some time after I went to Randle Works in 1954, we were still busy filling 1,000lb bombs and storing them in the Valley tunnels and at Randle.

In April 1954, I was working as an engineer at the ICI Rocksavage Works when the works manager called me into the office. Present was the Divisional Technical Director, 'Tommy' Wallace. He said: 'We have a job



The second American Forward Filling Depot (Station No. 572), serving the airfields of the 1st Air Division in Northamptonshire, was located at Melchbourne, virtually midway between the Eighth Air Force bases of Chelveston and Thurleigh.

for you, Toler. We want you to go to Randle Works and take over from Mr Marshall who is leaving. Your job title will not be Works Manager but Resident Section Manager but it will mean the same thing.' I had been hoping for a works manager's job but as this seemed the next-best thing, I accepted.

I knew little or nothing of the Randle operation at the time and had only met Mr Marshall, the present works manager, once. I discovered that it was an 'agency' factory involved with mustard gas, run by ICI for the Department of the Ministry of Supply.

I arrived one morning to be introduced to the staff in Mr Marshall's office. I so well remember them — they were all characters, and a marvellous team with a dedication, humour and team spirit which I found very similar to that which I had found in the Army. I think it was working, doing a dangerous but essential job, as they had been during the war, coupled with the need for secrecy, which had formed them into a self-contained team.

Edwin Stopford ('Stoppy'), the chief engineer, was originally a marine engineer. Wallace Peacock was the plant manager and senior chemist, Len Bradley the plant engineer, and Peter Woodward the chemist in

charge of the Valley Tunnel Storage. Oliver Storey was the works accountant and was also in charge of the office. Miss Marsh was the accounting machine operator (no computers in those days!) with Doug Whitby on accounts. Allan Hedgecock was in charge of records, Macdonald in charge of the drawing office and Jack Smith was the safety officer.

After the introductions, Marshall handed a key to Oliver Storey and asked him to open a large filing cabinet on the wall which, to my amazement, was full from top to bottom with every conceivable kind of drink!

The foremen, if I can remember their names, were also great characters and excellent at their job: Tom Ward in charge of the fitters; Ernie Whitham, electricians; Len Dutton, joiners and yard; George Palmer, process foreman; Reg Gartland, decontamination and protective clothing; Gilbert Turner, security. (There were several others whose names, regrettably, have escaped me.)

From the end of the war when production ceased up to September 1956, the production plants at Randle were kept in a state so that the manufacture of mustard gas could easily be recommenced at any time. In 1948, the Syrup plant had been quickly turned over to



As has been explained earlier, Britain dispensed with chemical weapons in 1956, at which time the FFDs were supposedly decontaminated. However, the work was not as thorough as it might have been and all the sites necessitated follow-up action. After the war, the FFD at Melchbourne had been renamed RAF Riseley (after the nearby village), and it was here in 1988 that an



extensive operation was carried out to decontaminate the area after a survey by the Environmental Safety Centre of the Atomic Energy Research Establishment at Harwell revealed that the FFDs had not been entirely cleared of mustard. *Left:* The fenced-off FFD and *right* a mouldering guard house, almost totally overgrown, still standing beside the entrance.



The joint RAF/Army operation (wittily titled 'Coleman Keg' after the popular brand of table mustard) began with the arrival of plant and equipment from 33 Engineer Regiment early in July. Work began in earnest on July 11, under the direction of the Joint Operations Commander, Squadron Leader G. R. Parfit,



one of his first visitors being a representative from the local Campaign for Nuclear Disarmament! The first job was to uncover and remove the lids of the three pots. Pot C was opened first and found to contain 80,000 gallons of water, seven skipfuls of solid waste and 83 flasks of mustard.

producing Glycol which was urgently required to keep the aircraft flying in the Berlin Airlift. At least this gave the production workers the feeling that at last they were doing something really useful rather than merely keeping the plant ready for production which was unlikely to happen. However, one plant was reactivated in 1951 and another in 1952, and when I went to Randle in 1954 there were large stocks of mustard — both at the factory, at FFDs under control of the RAF, and at Valley.

The main activity when I arrived at Randle was the filling of 1,000lb bombs with mustard gas. These were approximately 6 feet long by 18 inches in diameter. The filling was an unpleasant and dangerous operation carried out in special cubicles with operatives in full protective clothing. No explosive charge or detonator was fitted — thank goodness! — and the bombs were stored in sheds on the site. There must have been hundreds of them. Looking at them in the storage sheds, they appeared menacing and unholy when one thought of the suffering they would cause, but we assumed that the very fact that we had them would deter any enemy from making a pre-emptive attack using poison gas.

As this was a Government operation, all the filling had to be done under the eagle eye

of the Government Inspectorate but I think in this case the inspectors tended to leave most of it to us!

There were also a large number of 25lb mustard gas shells in storage, but we did not fill any whilst I was there. When they had been filled previously, it had been difficult to ensure that the correct charge of mustard gas had been put in each, so an ingenious method of measuring the level of liquid in the shell had been devised by Dr D. E. Palin. This depended on a sound being projected into the cavity in the shell above the liquid by blowing a jet of air across the opening, much like a penny whistle produces its tone. The frequency of the sound varied with the size of the resonant cavity in the shell (as it would in an organ pipe) and hence on the space above the liquid in the shell. This frequency was measured electronically and displayed on an oscilloscope. Several of these devices were still at Randle when I was there although we never had occasion to use them.

The protective clothing which we had to wear if likely to be in contact with liquid mustard gas consisted of a jacket, trousers and hood made of linen impregnated with linseed oil. It was very stiff and uncomfortable and the drill for dressing and undressing was extremely strict and was a very important part of the Randle operation.



Typical mustard flask removed on 'Coleman Keg', pictured specially for us by the Chemical and Biological Defence Establishment at Porton Down.



Representatives from Porton Down were on site to inspect and analyse samples from each pot and advise on disposal in conjunction with experts from Harwell, the local county waste disposal officer and commercial contractors. Left: On Day 7 a fire broke out in Pot B from which 15,000 gallons of water, two skips of waste and 33 mustard flasks were later removed. Analysis of the water showed traces of several products of mustard breakdown in various concentrations of 10 to 100 ppm.



The third pot revealed a further seven flasks of mustard, two skips of waste and 5,000 gallons of water. After all the pots had been cleaned out, fresh water was introduced, at which point representatives of the press were invited to inspect the site as a demonstration that all had been made safe. The lids were then replaced pending total removal of the pots by a civilian contractor at a later date. Nevertheless, the site still remains securely fenced off, with notices warning of the danger.



THE LORD'S BRIDGE EXPLOSION

At the end of 1954, it was decided by the Government and Ministry of Supply that all stocks of mustard gas and other poison gases would be destroyed but the American solution of dumping at sea would not be used by us. Up to then the method used by the RAF had been to burn such material in the open on concrete pads in remote sites such as Harpur Hill in Derbyshire and Bowes Moor in Yorkshire. This was a most unsatisfactory method as large volumes of smoke were produced, and not all the mustard was consumed. Some remained as vapour distributed to the atmosphere and there was contamination of the concrete and surrounding ground.

Then, in January 1955, I was sitting in my office when the telephone rang and a high-ranking officer in the RAF announced with some considerable alarm: 'There has been a serious explosion at the FFD at Lord's Bridge near Cambridge. Could you come down at once to give technical advice and assistance as there is a danger of serious contamination?'

'Certainly if you will send an aeroplane to collect me', I replied. Somewhat to my surprise this was agreed to and that afternoon



It was at FFD No. 4, situated just off the A603 south-west of Cambridge, that the most dramatic incident occurred. Today, Lord's Bridge is not marked on the Ordnance Survey map, but during the war it was the location of an RAF bomb store and a small, grass-surfaced training aerodrome. A fenced-off wood on the left-hand side of the lane leading to Comberton marks the site of the former filling depot which came to a sudden end on January 11, 1955 when, at 9.55 a.m., one of the three mustard pots suddenly exploded.

Peter Woodward and I drove to the RAF aerodrome at Harwarden, near Chester, where eventually a two-seater Prentice arrived. I sat in the second pilot or observer's seat while poor old Peter had to huddle somewhere in the fuselage. He had never flown before and said afterwards that he had never been so cold and frightened in all his life! It had been snowing and was getting dark when we eventually arrived at Duxford. It was fortunate perhaps that during my Service days I had flown to Duxford before as I think our pilot was somewhat lost. However, we were delivered safely by him with the comment: 'Here you are, boffins!'

The gas at Lord's Bridge, known as Y25, was mustard gas diluted with benzene to make it more effective by penetrating the skin as already described, but this also made it highly explosive. It was stored in underground concrete tanks, 25 feet in diameter,

25 feet deep, with 18-inch concrete lids. For some reason, an aircraftman had been using an oxy-acetylene torch in the vicinity with the result that there had been a tremendous explosion. A black cloud of smoke and mustard gas vapour was distributed over the countryside but fortunately with no serious casualties.

There was little we could do, as the fire had already been put out and most of the mustard gas which remained after the explosion had been destroyed in the fire. What remained in the tank had to be transferred to another tank, and the basic decontamination process with bleaching powder carried out. A Royal Air Force fireman, Corporal John Saunders, was later decorated with the George Medal for his courage in fighting the fire, and the site commander, Flight Lieutenant Edward Campbell, was awarded the MBE.



A violent fire followed the explosion which sent up a huge black cloud of smoke and debris. Corporal John Saunders (*left*), the NCO in charge of firefighting at Lord's Bridge, immediately donned his anti-gas equipment and, in spite of the risk of poisonous fumes from the blaze, stood his ground on the very edge of the crater, personally directing a stream of foam on to the remains of 'K' tank for 30 minutes until the flames were subdued. His action led to the award of the George Medal, the citation recording that he 'undoubtedly prevented what may

well have been a major disaster from the spread of toxic vapour over a wide area'. The site commander, Flight Lieutenant Edward Campbell, was awarded the MBE (Military Division) for his 'high degree of courage and valour' in directing his men and searching for survivors. It was due in part to his action that there were no injuries to either service personnel or civilians. *Right*: Now the FFD is in private hands, although we were informed that the current use is in keeping with its history as the owner now uses it as a proving ground for fireworks!

DESTRUCTION OF MUSTARD GAS

Two months later, a demonstration was carried out at the Chemical Defence Experimental Establishment (CDEE) at Porton Down in which mustard gas was burned in an 'Apparatus Oil Smoke' (AOS) which had been specially modified for the purpose. The AOS was a portable piece of equipment which had been developed for making smoke in the field by burning waste oil.

Basically, the equipment consisted of a petrol burner into the flame of which was injected the waste oil which burned and produced smoke. As modified, in place of the oil, mustard gas was injected and burned, additional air being introduced to achieve complete combustion. Consequently, Randle was instructed to carry out further tests and to destroy by this means the remainder of the unserviceable mustard gas from the Lord's Bridge explosion.

The AOS as supplied was driven by a twin-cylinder petrol engine but, like many engines, was difficult to start in the very cold weather during which the trials were carried out. It was also not designed for continuous running so it was replaced by a flame-proof electric motor. As the 5-ton tanks holding the mustard gas and the pipelines had to be made safe from the risk of explosion, the space above the liquid was filled with nitrogen — an inert gas which will not support combustion.

I wanted to be sure that all the mustard gas had been burned, so the effluent gases were passed through a chimney whose temperature was above 600 degrees Centigrade — a temperature at which any mustard gas present must decompose.

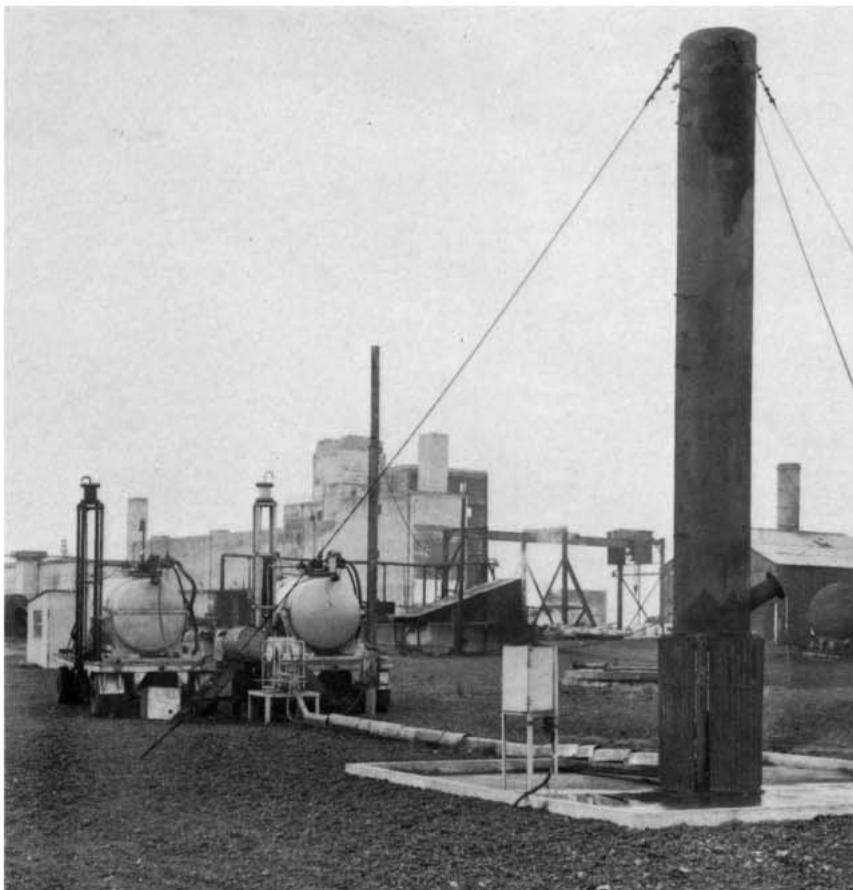
Between January and October 1956, 129 tons of Y25 were consumed. Five tons of Y3 (mustard gas without benzene) was also destroyed, the cost of the destruction being estimated at £18 per ton with petrol at 3/6d (17p) a gallon!

In September 1956, it was agreed by the Ministry of Supply that all the poison gas manufacturing plants should forthwith be kept on a 'care and maintenance' basis only, which meant that they did not envisage that they would be used for immediate production in the foreseeable future. A decision had also been taken that all existing stocks of mustard and other vesicant gases in the UK — in all some 6,000 tons — were to be destroyed and Randle was asked to design and construct suitable equipment to do this.

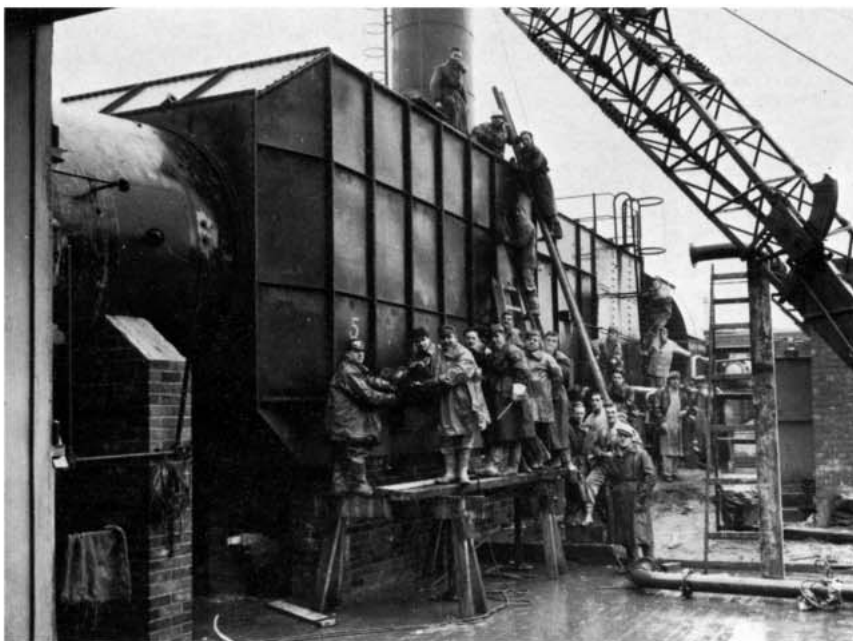
When mustard gas is decomposed by burning, the products produced, apart from carbon dioxide, are hydrochloric acid and sulphur dioxide — two gases which are very strictly controlled by the Alkali Inspectorate and which, in the quantities envisaged, would certainly not have been allowed to be emitted into the environment although today more sulphur dioxide than this is being discharged daily from our coal-fired power stations. In addition, we had to be absolutely sure that no unburned vesicant could escape.

After the trials with the AOS, the Ministry said they could supply us with a large burner which either came from the Royal Aircraft Establishment at Farnborough or from the Admiralty. It may have been something to do with a jet engine or a naval boiler but, wherever it came from, it ran on diesel fuel and was very powerful.

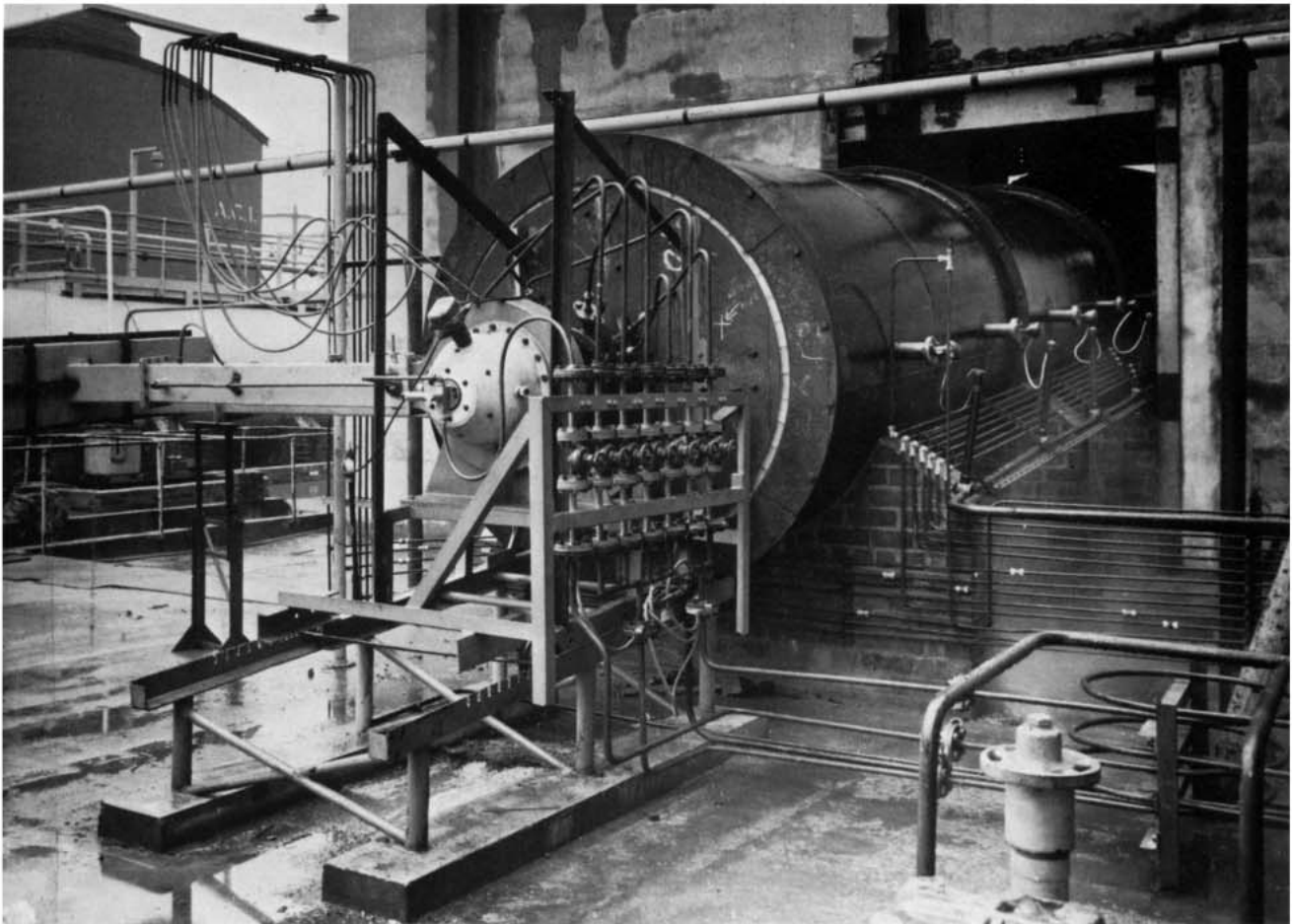
There was also at Randle a large ventilation system with scrubbing equipment and a chimney which had been used for ventilating the production sheds. It was therefore decided that this should be the basis of the plant. The mustard gas would be burned in the burner, passed through a brick-lined furnace and the gases — sulphur dioxide, hydrochloric acid and some carbon dioxide — absorbed in the scrubbing system and then discharged to atmosphere via the chimney.



The Lord's Bridge explosion must have opened eyes in the higher echelons to the potential hazards of continuing to maintain large stocks of mustard all round the country, and it was possibly one of the factors which led to the abrogation of chemical weapons by Britain the following year. The decanting of mustard bombs, mainly 65-pounders, and the burning of the mustard had been started back in 1945 — indeed, some of the old crude open-air burning sites investigated by Harwell in 1987 still bore traces of soil contamination of up to 13 per cent. Therefore, once the decision had been made, a concerted programme had to be mounted to dispose of the thousands of tons of vesicant in store. This was the first test rig set up by Major Toler at Randle to burn off the remainder of the Lord's Bridge mustard. It was basically a converted smoke generator consisting of one tank containing fuel which fed the burner while the contents of the second tank, which usually held waste oil to produce smoke but now contained the mustard, would be sprayed into the furnace.



Construction gang wearing Light Protective Clothing (LPC) working on the plant specially constructed in 1957 to destroy the main stocks of mustard.



The burner was erected at one end of a horizontal steel tube, 6 feet in diameter and 30 feet long. This was lined with firebricks, and a series of temperature pockets with recorders inserted throughout its length in order to be absolutely certain that the mustard gas passed through an area above its decomposition temperature. At the far end of the tube, a mild-steel baffle plate was inserted to cause a certain amount of turbulence which prevented any vapour passing straight through the tube before it had time to be decomposed. As the gases would now be too hot to pass straight into the scrubber (which was ebonite-lined), another steel tube 8 feet in diameter was erected in line with the brick furnace. Here there was an annular gap of approximately 12 inches which allowed cold air to be drawn in and so cool the gases. Although this would increase the total amount of gas which had to pass through the absorption system, in practice it worked well.

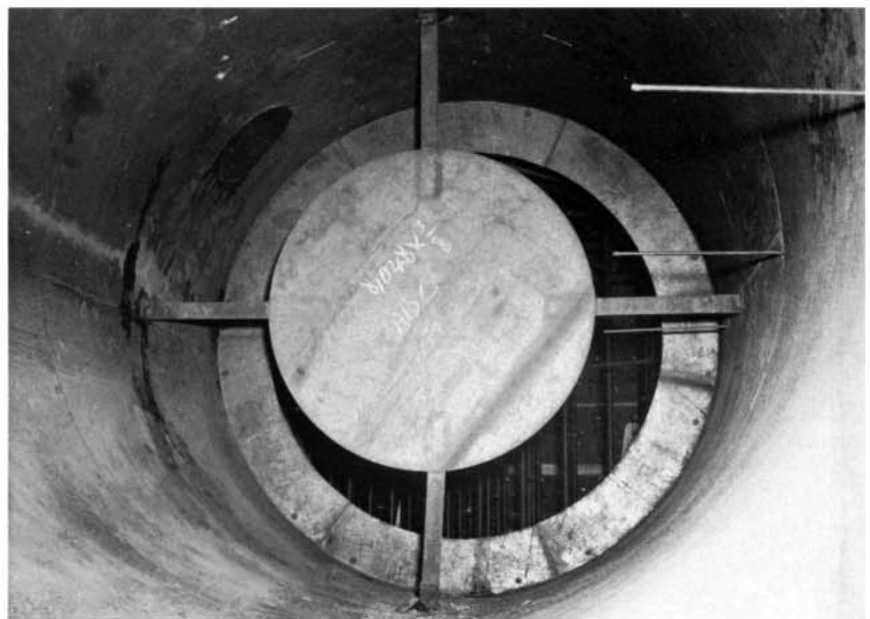
The cooled gases then passed into the absorber which was an enormous rectangular box as large as a small house lined with acid-resisting ebonite and with a large number of spray nozzles. Originally, these sprays had been fed with water as this had been considered adequate for the duty for which it had been originally designed. However, it was decided that caustic soda solution should be used instead, in spite of the expense, to prevent any sulphur oxides from escaping. The amount of caustic soda used was very substantial but it ensured that no dangerous gases escaped. The gases were pulled through the absorber and discharged to the chimney by powerful ventilation fans.

The burner was in the open but all the controls were in an adjacent building with a toughened glass panel through which the burner could be observed. The mustard gas was stored in steel tanks from which it was fed to the burner by a series of Hamworthy

The diesel-powered burner — the heart of the mustard gas destruction plant at Randle. Major Toler supervised the operation to burn around 6,000 tons of liquid gas which continued night and day for a two-year period.

gear pumps. Flow meters and pressure gauges were provided and the burner had been modified so that first diesel and then mustard gas could be injected into the flame, the idea being to start up on diesel to get the furnace up to temperature and then to turn over to mustard.

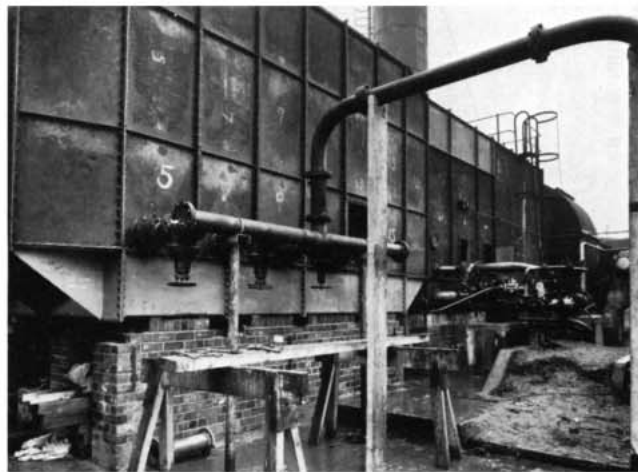
As the plant would have to be run continuously, a large tank farm had to be erected in the vicinity of the plant so that sufficient material would be available on site. Trains transported the mustard gas from the Valley Tunnel Storage but it is unlikely that many people knew that those long trains of



The interior of the furnace, showing the baffle plate positioned to break up the air flow to stop unburned gas passing straight through. The rods on the right are the heat sensors.



The cooling chamber of the vesicant destruction plant. Its purpose was to allow air to be drawn in through the annular opening to help cool the superheated exhaust gases.



The absorption chamber was lined with ebonite and fitted with caustic soda sprays to 'scrub' the air to ensure that no harmful products remained before its discharge to atmosphere.

tank wagons travelling through the Cheshire countryside contained enough material to devastate the entire region had it been released. The trains (*see illustration on page 18*) moved mostly at night and throughout the operation no incidents took place.

Construction of the plant was completed about the end of 1957. We had already run the equipment on diesel oil for some time to check that everything worked and that the temperature of the furnace was high enough and the fans and absorption system worked correctly.

Then the great day arrived when I decided we must now take the plunge and start the destruction of the mustard gas. I posted George Palmer downwind in the old Run-corn town — near the old transporter bridge — to report if there was any smell or sign of unburned mustard. We had a sampling point at the top of the chimney from which a sample could be sucked into our laboratory where an analyst (Mr Sadler) was waiting to check for any mustard. Wallace Peacock, the chemist, was also on hand to double-check. We all donned protective clothing. I think 'Stoppy', the chief engineer, and Len Bradley (and of course the process men who were to run the plant) were there. The furnace had been running for twenty-four hours or more and was well above the operating temperature. We gingerly started to feed mustard to the burner. I went quickly to the lab but Sadler reported no sign of mustard. Report by phone from Palmer — all clear. With a sigh of relief we increased the rate. I remained at the plant for the next twenty-four hours and all went well. There was a slight plume of white vapour at the top of the chimney but this was undoubtedly water vapour and harmless.

There was one slightly unfortunate incident which shows how easy it is to overlook something when designing a plant. The tanks containing the mustard supplying the burner were of heavy steel plate and sealed to prevent any escape of vapour. However, as they emptied, a vacuum built up and one tank collapsed like an empty beer can. Fortunately it did not fracture and no gas escaped.

Thereafter the plant ran continuously for nearly two years on shift and burned approximately 6,000 tons of mustard gas as well as a certain amount of other material. In fact, we were asked at one time if we would destroy some unpleasant chemicals for ICI which we did.

The whole operation was a success and the Chief Alkali Inspector (who is responsible for checking emissions of noxious gases to the atmosphere) wrote a letter at the end of the operation, thanking us for having carried it out satisfactorily.

EPILOGUE

One of the lasting memories of my time at Randle was working with Government departments. Their officers were charming people — Dr Owen, Mr Corbell, and Mr Howie, to name but a few of those with whom we came in contact — but I had the feeling that they would never take a decision unless pushed into it. When, as so often happened, they discussed whether something could be done, and I said yes of course we will do it, they seemed surprised. The idea that we could destroy all the mustard gas by the method I proposed really shook them as it appeared to be so unorthodox, but they gave their approval. Perhaps their understanding of the potential of our work did not fit in with their attitude of mind and, looking back, some of the methods we employed were pretty rudimentary, even 'Heath Robinson' to some degree, but they worked which was what mattered.

Somehow ICI gave me the impression that they were not really interested. Perhaps they were not making enough money out of it although they got a fee for managing the factory. It was a great pity. Randle was in

many ways a social and industrial experiment with many aspects which were criticised but with a spirit which was seldom equalled in any other industrial establishment. It had a work force, described by one of the works engineers as a bunch of 'loveable rogues' who when need demanded would drop their boisterous ways and work magnificently on dirty and dangerous jobs which in other places would have called for extra pay and union intervention.

So the factory died. Two labourers were kept on as caretakers — Cyril Scragg and 'Taffy' Rowlands who had been there since the beginning. A wrangle no doubt went on as to whether ICI would buy the site.

Now it is a tip where contractors have taken over. One building, an old workshop, stands stark and lonely with the ruins of a smaller building left from one of the plants, and the concrete bunkers which once housed the sub-station are left to the passing seasons. The skeletal remains of one of the little trucks which took the men in their FPC to work, lies derelict and overgrown. The ghosts of Cyril and Taffy haunt the place which has so many memories.



The irony is that Randle, although having been completely demolished, is still used for waste disposal today, although of a more permanent nature than before as it is intended to landfill the site to a depth exceeding 100 feet. The new Chemical Weapons Convention closed a major chapter in the history of chemical warfare and arms control. Quite coincidentally, the 75th anniversary of the Chemical and Biological Defence Establishment (CBDE) in 1991 has been marked by the publication of *Porton Down: 75 Years of Chemical and Biological Research* by Her Majesty's Stationery Office in December 1992. Written by Graydon Carter of CBDE, this is the first book about Porton Down written specifically for a public readership.

**AFTER THE
BATTLE**
IT HAPPENED HERE



MUSTARD DISASTER AT BARI

By Karel Margry

On the night of December 2, 1943, over 1,000 Allied military personnel and an unknown number of unprotected Italian civilians died at Bari, Italy, when one hundred tons of mustard poison gas were unleashed. The bombing of Bari was the worst shipping disaster suffered by the Allies since Pearl Harbor. Seventeen ships were totally destroyed and eight others severely damaged. Yet, the greatest tragedy of the bombing occurred when the merchantman USS *John Harvey* exploded and her approximately one hundred tons of 100lb mustard bombs were

blown apart. Liquid mustard began spreading across the harbour, some of it sinking, some burning, some mixing with oil floating on the surface, and some of it evaporating and mingling with the clouds of smoke and flame. The crew of the *John Harvey* who knew about the secret cargo died when the ship exploded. The men struggling in the harbour waters, the civilians enveloped in the deadly clouds of smoke, and the rescuers working on the docks were all unaware of the presence of the mustard. Many of them died still not knowing about it. Others were

blinded or burned. Hospital personnel treated the survivors for shock and exposure, not realising that they had been subjected to a chemical agent. It was not until many of the patients had died without obvious cause that an investigation was launched and the true reason for the deaths learned. However, the true extent of the disaster of the Bari raid was to remain a well-kept secret for many years.



Top: Bari, December 3, 1943, in the aftermath of one of the most successful German attacks on Allied shipping during the war. However, little did the Luftwaffe know that one of the ships hit was the USS *John Harvey*, which was secretly loaded with mustard gas bombs, and that the clouds of black smoke

were spreading deadly poison across the harbour. **Above:** The Nuovo Molo Foraneo in the background — the outer mole to the harbour — was called the 'East Jetty' by the Allies. Most of the 17 ships sunk in the raid were along this mole, moored side by side with stern fast.



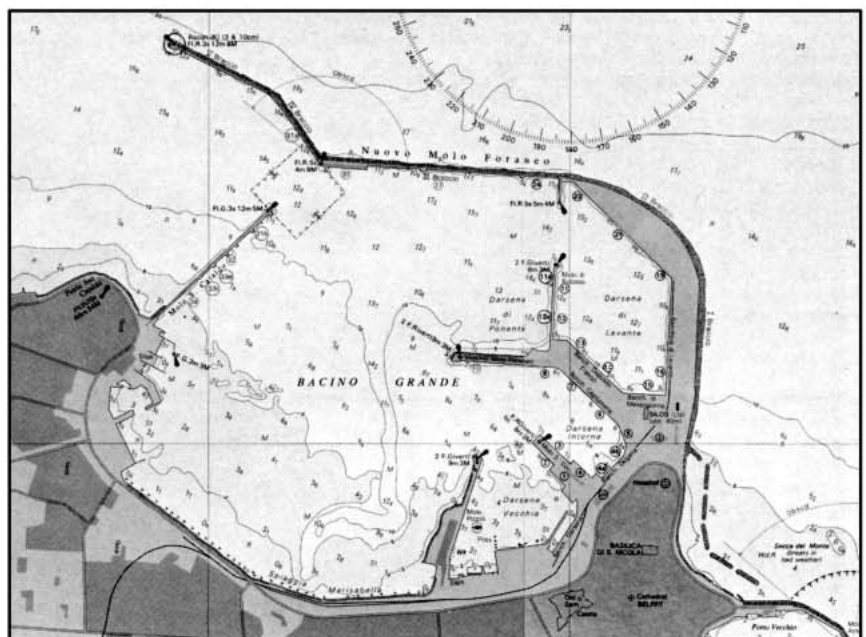
Bari, a city of about 200,000, is one of Italy's major ports on the Adriatic. With a history going back to Roman times, the city and harbour are both divided into the *vecchia*, or old, and *nuova*, or new sections. The old, mediaeval part of Bari, with its labyrinth of alleyways, was built on a peninsula washed by the sea on three sides. This was where the fishermen and dock labourers and their families lived. New Bari, with its long, wide streets and modern buildings, was the well-to-do business centre, where the elite hotels, theatres, opera house and university were located. The centre of new Bari lay between Corso Vittorio Emanuele II, Corso Cavour and the railway station at Piazza Roma.

Bari had been little affected by the war. Most Allied air strikes had been against the airfield on the outskirts and the city itself had suffered only slight damage. Captured, with all its docks intact, by a Jeep patrol of Popski's Private Army under Lieutenant-Colonel Vladimir Peniakov (soon followed by a detachment of 2nd SAS under Major Roy Farran) on September 11, 1943, Bari quickly became the Allies' main port on the eastern coast of Italy, supplying both the British Eighth and American Fifth Armies and also the newly-formed US Fifteenth Air Force.

The Fifteenth Air Force was busy establishing itself on airfields around Foggia, 70 miles north-west of Bari, and this made for a strong American presence in the city. In November, the Americans had begun to set up huge supply depots, mainly in the industrial area to the north of the harbour and near the 'Bambino' Sports Stadium (nicknamed so because it was Mussolini's gift to Bari as a reward for having more male babies in a certain period of time than any other city of its size). The US 5th General Depot had established itself in a former automobile

Bari photographed four months before the fatal air raid. (1) West Jetty (Molo di San Cataldo). (2) East Jetty (Nuovo Molo Foraneo). (3) Vecchio Molo Foraneo. (4) Molo San Vito. (5) Molo Pizzoli. (6) The Stazione Marittima housing the Allied War Shipping Administration Office. (7) Old Fort, the Port Director's Office. (8) Lighthouse. (9) 'Bambino' Stadium. (10) US 5th General Depot. (11) 4th Medical Supply Depot.

works; nearby, in a former Italian Army Depot, and, just across the railroad yards, was the US 4th Medical Supply Depot, was the 5th Medical Supply Depot.



The present-day Admiralty chart shows that the layout of Bari harbour has remained virtually unchanged, except that the Nuovo Molo Foraneo, the East Jetty, has been widened on the seaward side with a broader quay platform and the mole itself has been extended, at a crooked angle, with an additional 2,500 feet.



Left: The former Italian Air Force headquarters building along the waterfront (Lungomare Nazario Sauro) of New Bari. Completed in 1935 as accommodation for the Comando della IV Zona Aerea Aeronautica Militare, in December 1943 it had just been taken over by main headquarters of the US Fifteenth Air Force, when the German raid hit Bari. Several bombs fell on and



around the building, and Major General 'Jimmy' Doolittle, in his office on the first floor, had a grandstand view of the enemy bombing the town and harbour. Today, the building is again an Italian Air Force headquarters, housing the Comando III Regione Aerea. **Right:** Fascist sculpture still adorning one of the buildings along Lungomare.

General J. H. Doolittle, commanding the Fifteenth Air Force, had chosen Bari for his main headquarters and the transfer of this administrative body, arriving by ship and plane, had started on December 1. Doolittle himself had just opened his Command Post in the former Italian Air Force headquarters building along the waterfront, different sections of his headquarters occupied several other buildings, and staff personnel was billeted in many school buildings and hotels in the port area.

In July 1943, at the time of the Allied invasion of Sicily, ominous reports reached Washington and London which indicated that Hitler, in a desperate move, was planning to resort to the use of poison gas to repel any further enemy advance into southern Europe. In August, US President Franklin D. Roosevelt issued a proclamation outlining Allied policy on the use of poison gas which stated that the US would under no circumstances resort to the use of chemical weapons 'unless they are first used by our enemies' and promised 'full and swift retaliation in kind' should the enemy resort to 'such desperate and barbarous methods'. To prepare against the possibility of a gas attack by the Axis in the Mediterranean Theatre of Operations, the White House, after careful consideration, granted permission to ship an adequate supply of chemical mustard bombs to be held in readiness at a depot at Bari in southern Italy.

The shipment, comprising 2,000 M47A1 100lb mustard bombs, was loaded on a train at the Eastern Chemical Warfare Depot in Maryland and transported to the Curtis Bay Depot in Baltimore, and from there to the Baltimore Cargo Port for embarkation. Assigned to accompany the lethal cargo to Italy was First Lieutenant Howard D. Beckstrom and six enlisted men of the 701st Chemical Maintenance Company, a unit specially trained to handle large-scale shipments of toxics. Their task was to check the bomb casings for any leaks or split seams, to guard against corrosion and vibration, and to test the bombs for dangerous pressures that might build up inside the casings and to vent them off if necessary.

The vessel chosen to carry the highly-secret shipment was the Liberty ship *John Harvey*, commanded by Captain Elwin F.

Knowles. Officially, Knowles was not notified about the exact nature of the cargo, but the veteran sea captain was well aware that his ship was carrying mustard bombs. For the trip, the ship was assigned a special cargo security officer, Lieutenant Thomas H. Richardson of the US Army Transportation Corps.

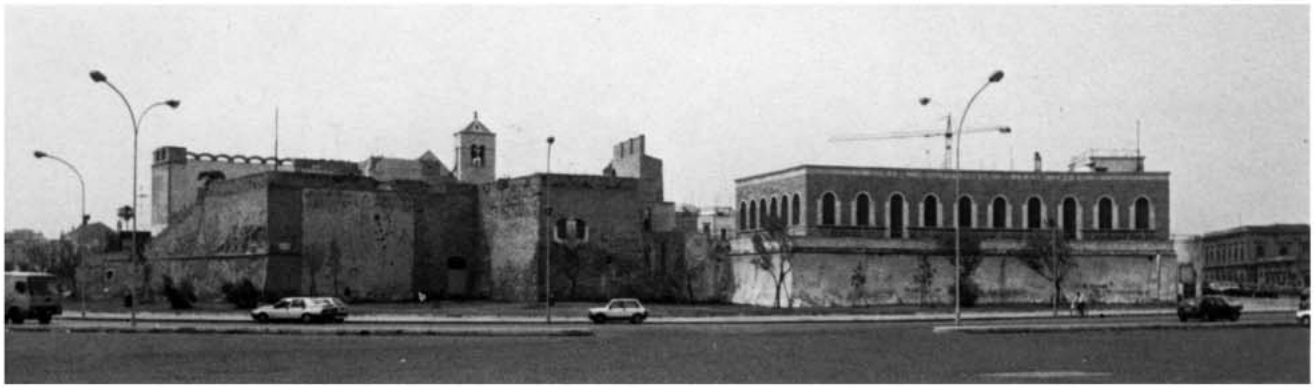
The *John Harvey* crossed the Atlantic in a convoy bound for North Africa, arriving in Oran, Algeria, without incident. On November 20, she sailed from Oran to Augusta, Sicily, arriving safely on November 25. On November 26, she began the last lap — across the Ionian Sea, through the Strait of Otranto, and up the Adriatic Sea — and, two days later, the 15-ship convoy entered the breakwater of Bari harbour, passing through the submarine nets strung between the Molo di San Cataldo and the Nuovo Molo Foraneo. The *John Harvey* was ordered to

moor at Berth 29 on the Nuovo Molo Foraneo, called the East Jetty by the Allies.

For the next five days, security officer Richardson made many trips to the War Shipping Administration office at the Stazione Marittima and contacted about every military officer stationed at the port in an attempt to get priority for the unloading of the ship. However, secrecy about the transporting of poison gas to the war zone was so strict that he could not disclose the real reason behind his requests. Captain Knowles made many trips to the War Shipping Administration office too, hoping to move up the unloading date of his ship, but since he was not supposed to know of the mustard bombs officially, he was stymied too. Apart from the military personnel aboard the *John Harvey*, no one else in Bari harbour, not even the British Port Director, knew of the mustard bombs.



In 1943, the Stazione Marittima on Molo San Vito housed the Allied War Shipping Administration office. It was here that Lieutenant Thomas Richardson, the security officer in charge of the secret mustard load, although he could not disclose the true composition of the *John Harvey's* cargo, pleaded in vain for an early unloading of the ship. Captain Elwin Knowles, the skipper of the mustard ship, officially not 'in the know', but definitely aware of the dangerous load aboard his ship, also visited the office with equally little success.



In late November, Generalfeldmarschall Albert Kesselring, German C-in-C in Italy (OB Südwest), called a conference of Luftwaffe officers at his headquarters at Frascati to discuss the best use of the available bomber force to thwart the Allied advance in Italy. Attending the conference were Feldmarschall Freiherr von Richthofen, commander of Luftflotte 2; Generalmajor Dietrich Peltz, commander of German bomber units in Italy and an outstanding expert on bombing techniques; and Hauptmann Werner Baumbach, ace bomber Gruppe commander. Each officer favoured a different type of target for the bombers: Baumbach suggested the Allied airfields around Foggia, Peltz favoured mass air raids against troop concentrations, and Richthofen wanted to bomb the Allied supply ships and harbours. He also knew which harbour would offer the best target. For the past week, an Me 210 reconnaissance plane, piloted by Oberleutnant Werner Hahn and flying at 23,000 feet, had been taking pictures of Bari, taking stock of the increasing numbers of ships in the harbour. (Many Allied soldiers in Bari had noted the contrails of the lone high-flying aircraft.) Richthofen's view prevailed and the meeting unanimously agreed that Bari was the ideal target for a surprise air strike. Richthofen was ordered to have all available bombers in northern Italy stand by for the mission. Oberleutnant Hahn was to keep up his daily reconnaissance sorties to determine the most opportune time for the raid.

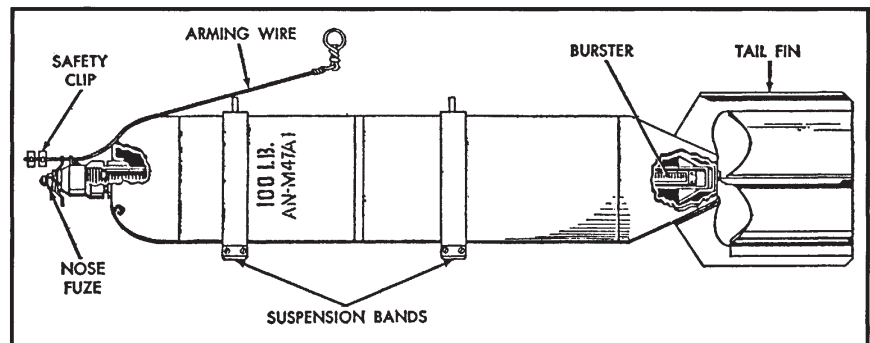
The forces assigned by the Allies to protect the port and city of Bari against air attacks were surprisingly weak. The RAF had no fighter squadrons based on Bari airfield, and those scattered throughout southern Italy and within range of Bari had escorting or attack assignments, not defensive missions. Bari's ground defences consisted of a single British light anti-aircraft unit, No. 2862 AA Squadron, equipped with 40mm Bofors guns. Another squadron, No. 2856, had been assigned to Bari but had not yet arrived in full strength. For gun direction, the gunners depended on a radar installation which was located on the roof of the Margherita Theatre at the end of Corso Vittorio Emanuele II and operated by No. 548 Mobile Signals Unit. By an unhappy coincidence, this installation broke down in the last week of November and, despite feverish efforts by technicians of No. 305 Mobile Signals Servicing Unit, it was still not back in operation by December 2. The Harbour Defence Commander, Captain A. B. Jenks, had warned his superiors about the vulnerability of the city, but none had taken him very seriously. As for protection of the civilian population, there were quite a number of air raid shelters in the new city, but in the old city there were few.

In the afternoon of December 2, several thousand Allied servicemen, and Italians had gathered in 'Bambino Stadium' to see a baseball game between two American teams of the 5th General Depot. That afternoon, some 30 Allied merchant ships lay in the

The old fort at Piazzale Cristoforo Colombo, across the street from the docks entrance, had been taken over for the British Port Director's Office. However, the shipping of mustard bombs to Italy was so secret that even the Port Director was not informed of the lethal load aboard the *John Harvey* and was thus unaware of the added danger to the harbour when this particular ship blew up.

harbour waiting to be unloaded. Every dock was occupied. Vessels were anchored and waiting at every pier and along the entire length of the sea-wall. Empty ships were lying at anchor inside the breakwater, ready to move out next morning. At about 5.30 p.m., a fresh convoy of ships from North Africa

and the United States arrived and started to enter the harbour. The lights on the cranes and all along the harbour were turned on, the Port Director having judged that no Luftwaffe plane could penetrate the defensive screen around Bari. The ships were tied up close, virtually touching each other.



The *John Harvey* was loaded with 100 tons of M47A1 mustard bombs. Each bomb was filled with 68.5lbs of liquid mustard, the only difference between the A1 and the A2 bombs being that the inside of the case on the A1 was painted with black acid-proof paint, whereas the A2 was coated with oil.



The radar installation, on which Bari's anti-aircraft defences depended for fire directions, was on the roof of the Margherita Theatre, at the waterfront of the Porto Vecchio. Operated by No. 540 Mobile Signals Unit, it happened to be out of action when the German bombing raid took place, leaving the town and harbour without any advance warning of the attack. The ack-ack gun crews were only alerted when the bombers came roaring in over their heads.



Left: The first bombs fell on the junction of the Via Abate Gimma and Via Sparano da Bari in the centre of the city. Right: Hundreds of civilians sought shelter in the Castello Normanno Svevo, the medieval castle at the edge of Old Bari which



overlooks the harbour. The sturdy walls of the castle saved many lives, protecting those within not only from the bombs, but also from the terrible blast from the ships exploding in the harbour.

That afternoon, returning from his reconnaissance flight, Hahn reported the presence of over 30 ships moored side by side on the East Jetty, at anchor in the harbour, or being unloaded at the dock. Shortly thereafter, some 105 Ju 88 bombers of KG26, KG30, KG54, KG76, KG77 and KG100 took off from various airfields in northern Italy. The force flew east until they were over the Adriatic, then south to Bari. During the flight, more bombers from airstrips in Yugoslavia joined the main force. The plan was for the attack to come in from the east, skimming the water at low level and just at dusk. The pilots were to use the 'Swedish turnip' technique (a method, developed by the Germans in 1940, of attacking ships sideways and from an altitude of 45 metres). At 7.25 p.m., the force turned west, on course for Bari. Just before the attack, they dropped *Düppel* (the German equivalent of the Allied 'Window'), tinfoil strips to jam the enemy radar. Flares were dropped, adding a brilliant light to the already floodlit harbour. It was 7.35 p.m.

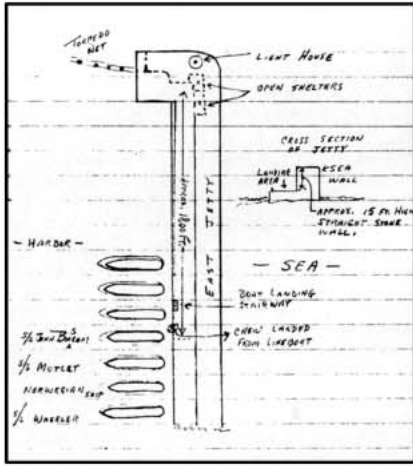
As the enemy planes came in at 200 mph, the shore battery anti-aircraft guns and countless AA guns on the ships opened up. The first bombs fell off the harbour, in the city, hitting Via Abate Gimma and Via Sparano da Bari. Veering to the left, the bombers corrected their course and worked their way up the harbour from south to north. In horror, ships' crews saw the bombs 'walking' straight towards the line of American Liberty ships anchored at the East Jetty.



This picture, taken by John H. Kiser, an American serving with the 5th General Depot, claims to show the harbour on December 1, the day before the raid. The *John Harvey* was berthed on the mole in the background but just out of the picture to the left.



Although there were plenty of light AA guns on the vessels in the harbour, the surprise low-level attack caught the crews off guard.



Sketch prepared by Captain Otto Heitmann, captain of the *John Bascom*, for his official report. Below: The landing jetty near Berth 26 on the East Jetty where his crew came ashore, only to find their escape route blocked by fire and debris. Right: The wounded were placed here, in open shelters at the end of the mole.



The first to be hit was the *Joseph Wheeler*, at Berth 23. She took a direct hit and burst into flames. Moments later, the *John L. Motley*, at Berth 25, laden with bombs and high-octane gas, took a bomb on her No. 5 hatch and the deck cargo on the ship caught fire. Next, one bomb hit the *John Harvey*, the mustard bombs ship at Berth 29, and started a fire. The crew fought desperately to douse the flames but it soon grew out of control. The countdown to disaster had begun.

Anchored next to the *John L. Motley*, at Berth 26, was a fourth Liberty, the *John Bascom*. Moored with stern fast, she was caught between the blazing *John L. Motley* and the ship on the other side. With only about 30 feet clearance between the ships, the risk of collision, probably resulting in the cargo exploding, was very real. To make matters worse, there were two ammunition ships moored ahead of her, blocking the escape way out. The bombers made a second run and this time the *John Bascom* received a string of bombs which hit from aft to forward, tearing off half of the bridge, caving in the forward deck, knocking out the ships' guns, and destroying all but one lifeboat. The skipper, Captain Otto Heitmann, ordered the seriously injured to be put in the

one remaining lifeboat. With 52 wounded, 20 more than the boat's capacity, the lifeboat was lowered into the water. By then, the inferno aboard the *John L. Motley* had burned away the stern lines of the *John Bascom* and the ship was drifting toward her flaming neighbour. Heitmann ordered the remaining crew to get into the water and hold on to the seine floats of the lifeboat. Casting off, and with only one good oar, the crew attempted to move between the two ships to the jetty. As the landing stairs were blocked by stern lines from other ships, the crew had to climb the five-and-a-half-foot high jetty wall, and laboriously lift the wounded up the quay. Their escape route back to the docks looked blocked by the inferno of the moored ships, so Heitmann ordered his crew — and survivors from other ships who had reached shore — to head for the lighthouse at the north end of the jetty. There, nearly a mile out to sea, a boat would hopefully pick them up. Arriving at the lighthouse, the men placed the wounded in two sea-wall shelters. However, with the flames spreading across the surface of the harbour and several of the blazing ammunition ships drifting towards them, the men at the lighthouse were in effect hopelessly trapped.



Left: The lighthouse was the last refuge for Heitmann's group of survivors. Some of the men could only just be discouraged from attempting to swim across the harbour entrance (right) to



the mole on the other side to try to escape from the smoke and flame coming their way. In 1943 the torpedo net sealed the harbour at this point.



For the Germans, the raid on Bari had been a complete success. They had achieved absolute surprise and found the harbour off guard and readily illuminated. Not one Allied fighter had appeared over Bari to attack them. Although they had to fly through a barrage of anti-aircraft fire from shore and ships, only two Ju 88s had gone down in the sea. As they flew out to the Adriatic, the pilots could see ships burning and exploding throughout the entire harbour area.

Among them were all three of the American Liberty ships set on fire by the bombing. The first to explode was the *John L. Motley*. Her mooring lines burned away, she smashed hard against the sea-wall and went off in a sheet of flame. The detonation caved in the whole port side of the *John Bascom*. Captain Heitmann's abandoned and blazing ship, causing her to sink instantly. The tidal wave produced by the explosion washed over the breakwater and threw several of Heitmann's group into the sea.

The second ship to explode was the *John Harvey*, the mustard bombs ship. Now a mass of flames and with her lines burned away, the ship was slowly drifting across the harbour towards the USS *Pumper* YO-56, a US Navy tanker with a half-million-gallon capacity and anchored north of the East Jetty, when suddenly she detonated. From the depths of the harbour leaped a vast mountain of flame with multi-coloured jets streaming from its rim. It rose more than a thousand feet into the air. The blackness above it was slashed with streams of crimson, pink, rose, orange and green. Even more violent than the first one, the explosion rolled about every ship in the harbour and created a tidal wave even more forceful than that of the *John L. Motley*. The blast wave thundered through the town like a tornado, adding greatly to the damage caused by the bombing.

Besides killing Captain Knowles and the crew on duty on the ship, the explosion killed Lieutenant Richardson, Lieutenant Beckstrom and his six chemical warfare men. The only men who could warn the others present at Bari that a large amount of deadly mustard gas had just been released over the harbour were now dead.

As liquid mustard began spreading across the harbour, the men in the water, the rescue teams working on the docks, and the frightened inhabitants of Old Bari were all unaware of the presence of the poison gas. Many men later remembered smelling garlic — the odor emitted by mustard gas — but dismissed the observation because of the more acute problems facing them. Without

knowing it, the survivors were swimming through mustard-contaminated water, rescuers reaching out to help them were unknowingly contaminating themselves, and all were inhaling the poisonous fumes.

The explosion of the *John Harvey* sealed the fate of several other ships around her. The *Yug*, a small Yugoslavian coastal vessel, already aflame from the bombing, simply disappeared in the explosion. The British freighter *Testbank*, moored stern at Berth 18, was ripped apart, only five of her 75-man crew having jumped ashore safely.

The third Liberty ship to explode was the *Joseph Wheeler*. Like the *John L. Motley* and the *John Harvey*, she completely disappeared. There were no survivors except the men who had been ashore.

The explosion of the *Joseph Wheeler* set fire to the *Fort Athabaska*, a British freighter anchored close by. Loaded for departure to North Africa, she had among her cargo two captured PC-RS500 German rocket bombs which, despite the heroic efforts of the crew, detonated in the extreme heat and reduced the ship to a shattered hulk.

The British tanker *Devon Coast*, anchored southernmost in the harbour, was hit in the No. 2 hold and within minutes was burning all over, forcing the half-blinded crew to abandon ship. Shortly after, she, too, exploded.

Moored alongside her, the Norwegian ship *Lom* had been struck and set on fire too. Her moorings parted, she drifted towards the *Devon Coast* and sank with it.

The Liberty ship *Samuel J. Tilden* had arrived that afternoon from North Africa carrying American air force and medical

personnel plus a cargo of trucks, two tractor-trailer units, and 100 tons of ammunition. At anchor some two miles out into the harbour, she was hit directly forward of the bridge. Fire broke out immediately and spread to the bow and then aft. At 8.45 p.m., the skipper, Captain Joseph L. Blair, gave the order for the 69-man crew and the 209 passengers to abandon ship. The men did so, 56 in lifeboats, 80 on rafts, and 115 on floats. The remaining 27 men were lost. To prevent her from exploding, the *Samuel J. Tilden* was scuttled by an Allied torpedo later that night.

The *Inaffondabile*, a requisitioned Italian schooner (skipped by US Navy officer Michael A. Musmanno), which was just leaving the Old Harbour with a cargo of olive oil for the population of the Sorrentine Peninsula, was strafed, burst into flames and sank in a few seconds.

Although not one ship escaped without damage and casualties, some were lucky enough to survive. The Liberty ship *Hadley F. Brown*, carrying ammunition, trucks, army clothing and mail for the British Eighth Army, had just been called to the dockside for unloading when the attack began. A bomb hit the port bow and badly damaged the hull, but she did not sink.

The British transport *Fort Lajoie*, at anchor in the harbour, was set on fire by one of the illumination flares and other fires were started by the rain of red hot splinters from the exploding *John Harvey*. While fighting the flames, the crew attempted to shift the ship out of the oily fires around it, but, finding it impossible to knock the steel pins out of the cable shackles, they sat out the raid at anchorage.

The USS *Aroostook*, a tanker loaded with 19,000 barrels of 100-octane gasoline, lying at anchor about 350 yards distant from the East Jetty, was badly damaged by the bombing. In no immediate danger of sinking, but too close to the burning ships to be safe, her crew got the ship under way, manoeuvring her through the burning oil to a safer anchorage further north.

A lucky bomb ruptured the large petroleum line running along the fuelling quay on the north side of the harbour and the oil poured out of the breaks and into the water. Ignited by the explosions, it produced a raging fire which spread rapidly across the harbour surface.

Meanwhile, on the East Jetty, Heitmann's trapped group of men tried to contact shore using a flashlight they had found. As the hours passed, the spreading fire forced the group to the very tip of the jetty. Some men wanted to swim the half-mile to the North-East Jetty, across the harbour entrance, but Heitmann talked them out of it, arguing the water was too frigid and too covered with oil to risk it. At 11.00 p.m., a small Norwegian coasting steamer, making its way out of the harbour, noted the flashlight signals and sent



a lifeboat to the jetty. In two trips, some 60 men were taken to the steamer, before the Norwegian captain informed Heitmann that he could not stay any longer, as he was drifting into the minefields close by. It was not until the group was spotted by the crew of the *Pumper's* whaleboat, busy with picking up exhausted and oil-covered survivors from the water, that relief came. In two perilous trips, the trapped men were evacuated to the shore. A British minesweeper, on its way out of the carnage, picked up some more. By the time the last men, Heitmann among them, were taken off, the fire had reached the torpedo nets.

The toll from the German raid was heavy, even without the presence of the mustard gas. In all, 17 merchant ships had been destroyed: five US Liberty ships: the *John Bascom*, *John L. Motley*, *Joseph Wheeler*, *John Harvey* and *Samuel J. Tilden*; four British ships: the *Testbank*, *Lars Kruse*, *Fort Athabaska* and *Devon Coast*; three Norwegian vessels: *Lom*, *Bollsta* and *Norlom*; three Italian ships: *Barletta*, *Frosinone* and *Cassala*; and two Polish ships: *Puck* and *Lwow*. Another six merchant ships had been seriously damaged: US Liberty *Lymann Abbott*; British *Crista*, *Fort Lajoie* and *Brittany Coast*; the Dutch merchantman *Odysseus*; and the Norwegian ship *Vest*. In



US Army photographers Blosser and Otto took a series of pictures on the day after the raid. Unfortunately, the names of these three blazing ships are illegible, but our best guess is that they are the British freighter *Fort Athabaska*, the Norwegian merchantman *Lom* and the British tanker *Devon Coast*. Unfortunately, none of the pictures taken from the Vecchio Molo Foraneo show the four Liberty ships which were more to the left. The sunken vessel to the left of the sailor (below) could be the *John Bascom*.



addition, the Yugoslav coaster *Yug* and the Italian schooner *Inaffondabile* had been sunk. More than 1,000 Allied servicemen had been killed or were missing.

The city of Bari had also been hard hit by the German raid. Bombs had come down all over the city. South of the centre, the Fifteenth Air Force headquarters and billet buildings were severely damaged. The very full British officers' mess, located in a former restaurant on the sea side of Lungomare Boulevard, was wrecked by hits and near-misses. In theatres and cinemas in the city centre, panic broke out as the audience crowded towards the exits. Outside, a milling crowd of Italians and Allied soldiers ran in all directions in great confusion. People jammed into air raid shelters, only to find most of them slowly filling with water. Many were crushed or drowned in the mêlée.

The old part of the city, located as it was between the new and the old harbours, took the brunt of the bombing. In one shelter, 17 people perished when the bombs broke a water pipe and blocked the exit. Several





hundred civilians sought shelter in the Castello Normanno Svevo, the famous 16th-century castle of Bari which overlooks the harbour. One house was set on fire by the bombing and the onshore wind quickly spread the flames throughout the Old City. There was little water to fight the fires and the nearby explosions of the ships in the harbour sent the firefighters racing for cover to save their own lives. Panic-stricken, many inhabitants raced for the water, diving in to douse burning clothes or splashing hands and faces with water, unaware that it was contaminated with liquid poison gas.

Further north, in the warehouse area along the railway, the American 5th General Depot took a severe beating. Behind the tents of the 41st Depot Supply Squadron, a train carrying some 300 German prisoners-of-war had just stopped and the prisoners had been permitted to leave the train for a rest break, when the bombs fell. In great confusion, prisoners and guards alike scurried for cover. An air raid shelter, full of prisoners despite being half-filled with water, received a direct hit and there were no survivors. Across the road, the baseball match in 'Bambino Stadium' broke off abruptly as the spectators went rushing for the exits. Fleeing back to the city along Via Napoli, many civilians were killed when a string of bombs landed on the street near its intersection with Via Brigata Regina.

After the All Clear siren had sounded, and just as people were recovering from the bombing, the terrific explosion of the *John Harvey* caused new damage and confusion. The blast completely ripped apart the mass of inhabitants of the Old City that had crowded along the shore. Behind them, houses were folded up like cardboard dollshouses and collapsed into heaps of rubble. Many died without knowing what had happened. Further away, the blast knocked down people in the streets, unhinged doors and shutters and blew in the windows of almost every building in the city. The concussion was felt at some points 20 miles or more from the harbour.

Yet, the worst tragedy was yet to come. The survivors of the bombing, of the sunken ships, of the explosions, of the inferno in the city, were all unaware that the cloud of smoke billowing over the harbour carried mustard gas and that with each breath they filled their lungs with the lethal mixture. To compound the tragedy, the doctors and nurses that were to treat the casualties of the raid were no better informed of the danger.

Bari in late 1943 had a large concentration of Allied service hospitals. The 2nd Medical District, which had been established on October 25, 1943 to control all Allied medical facilities in south-eastern Italy, had its headquarters at Bari. One of the largest Allied medical centres was in the Bari Polyclinic, a huge complex of buildings on Piazza Giulio Cesare, about a mile from the harbour. Concentrated here were the 3rd

Left: Another picture snapped by John Kiser on the morning after the raid was taken in Old Bari, on Strada San Vito, the small square next to the medieval castle. Right: The row of houses directly faces the sea, and it was probably only the presence of both the Vecchio Molo Foraneo and the Molo San Vito between it and the harbour that saved it from being flattened by the tidal waves and the blast from the exploding ships.

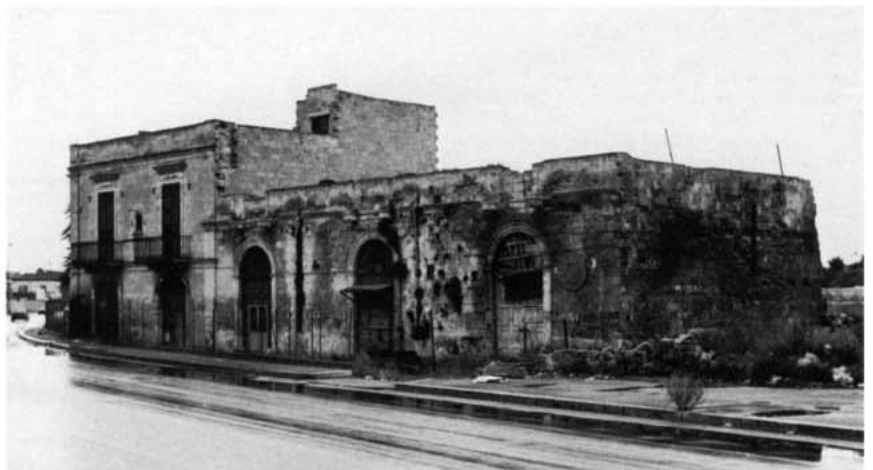


The luxurious restaurant at the end of Molo San Nicola. In 1943 this was the British Officers' Mess which was hard hit by the German bombs. About every window in the glass-enclosed building was shattered by the blasts, and panic broke out as the female vocalist stopped singing and everyone scurried for cover.

New Zealand General Hospital (Colonel G. W. Gower), the 98th British General Hospital (Colonel W. J. A. Laird), the 14th Combined General Hospital, the 30th Indian General Hospital, the 34th Field Hygiene Section and the 4th Base Depot Medical Stores. Two blocks away, in the former Italian Ospedale Militare on Via Generale Bonomo, was the 26th US General Hospital. Elsewhere in and around the city were the 54th British General Hospital, the 42nd West

African Section, the 16th Indian Field Laboratory, the 5th Venereal Disease Treatment Centre, the 3rd Field Transfusion Unit, and the 35th Anti-malaria Control Unit.

Although most of these units had only just settled in and, in many cases, were still short of personnel, equipment and supplies (in fact, 22 men and much equipment of the 26th US General Hospital were on the *Samuel J. Tilden*, awaiting unloading), they were already in full operation and functioning



Evidence of the 1943 air raid: a bomb-damaged warehouse still standing on Via Napoli in the industrial area of Bari.



routinely. Like everywhere else in Bari, the explosion of the ships in the harbour shattered all the windows and pushed in doors of the different hospital buildings. The staffs were still treating casualties from flying glass and cleaning up the mess, when the first victims from the harbour disaster began pouring in. They were covered with oil, badly burned and in a state of shock. Some were suffering from exposure, having been in the sea for hours before being rescued. Due to the onrush of patients, there was no time to take the oil-soaked wet clothes from each of them, wash their bodies clean, and give them dry hospital gowns or uniforms. First priority was given to surgical cases. With the others, supposedly suffering only from blast, immersion or shock, normal practice was followed. The doctors wrapped the casualties in blankets to keep them warm, giving plasma to the badly burned in an effort to prevent secondary shock, and positioning stretchers so that the patient's head was lower than his feet to help maintain the blood supply to the brain.

By prescribing the normal treatment for shock, the doctors felt they were making the right move. They had no idea that toxic chemical mustard was involved. By allowing the mustard-in-oil solution to remain on the skin for 12 to 24 hours, by keeping the patients warm and give them hot tea to drink, they unwittingly created the very conditions for an optimal absorption of the mustard. More than 800 casualties were hospitalised following the air raid, 628 of which were later found to suffer from mustard exposure.

Next morning, Bari saw an exodus of its civilian population, an unending stream of refugees fleeing the city. In the harbour, ships that were still seaworthy also left. A

Left: Many of the casualties were taken to the Bari Polyclinic on the Piazza Giulio Cesare which the Allies had already commandeered for use as a general hospital. Right: This is not the main gate but a side entrance on the corner of Viale Ennio and Via Marroccoli.

strange experience happened to the Allied ship *Bisterra*. She had come through the raid unhurt and immediately took part in rescue operations. After picking up 30 survivors from the slime-covered water, the Port Director ordered her to clear the harbour; she headed for Taranto. Four to six hours later, the entire crew began having eye trouble — a gritty sensation followed by a burning pain. The captain ordered all hands to use an eyewash, but the pain continued. By the time the ship reached Taranto, 18 hours after the raid, the crew was almost completely blind and had great difficulty in mooring her. The mustard poison was taking its effect, but as yet nobody understood what had happened to the sailors.

Back in the Bari hospitals, the same mysterious ailments were occurring. Six hours after the raid, patients began having eye trouble, with excessive secretion of tears. Within 24 hours, the eyes of many had swollen and eyelid spasms were so bad that patients complained that they were blind. The doctors had the eyes washed out, then treated with a combination of atropine and albucid.

Nearly all patients also showed signs of mysterious burns and blisters. The burns corresponded exactly with what part of the body had been in contact with water or oil slime. Survivors who had only had their legs in the water, blistered only there; those who had swum, blistered all over their body. The skin reaction was especially severe and distressing in the genital region. The penis in some cases was swollen to three or four times

its normal size and the scrotum was greatly enlarged. For treatment, the doctors applied vaseline-gauze or bland ointment dressings with sulfanilamide powder, a bland powder, in some cases amyl salicylate, in others even tannic acid, but none of these measures was very effective.

The doctors were particularly puzzled by the fact that the patients with shock diagnosis had a very low pulse and blood pressure, but lacked the other symptoms associated with clinical shock: restlessness, shallow breathing, rapid heart action. Also, those that had been diagnosed as blast-injured lacked typical blast symptoms like chest pain, altered respiration, injured eardrums or blood-tinged sputum. Most cases did not respond to plasma, warmth, stimulants or morphia. A striking feature was the general apathy among the patients. They could be roused, but only with fleeting effect.

The feeling began to spread among the medical teams that a chemical agent of some type or other was responsible for the condition of the patients, but no one could definitely define which one. Contemplating the possibility that the agent had come from one of the Allied ships, the doctors could only think of white phosphorous for 4.2-inch smoke shells and smoke pots, or napalm for flame-throwers. However, neither of these were known to cause the symptoms being shown by the men in hospital. Many doctors were convinced that the chemical was not from an Allied cargo, but that the Germans had probably used chemical bombs during the raid.



Currently empty, this is the building used by the British 98th General Hospital in the grounds of the Polyclinic.



Another hospital which received many of the mustard casualties was the US 26th General Hospital in the Sanatorio Cortugno, just down the road from the Polyclinic. This is the gate of the sanatorium on Viale Orazio Flacco. When medical staff in Bari were unable to explain the reason why an increasing number of patients were dying of their injuries, they became very worried and alerted Allied Forces HQ in Algiers.



Lieutenant Colonel Stewart F. Alexander, the consultant officer in chemical warfare medicine with the Allied Forces Headquarters, was immediately despatched to Italy to look into the matter.

Meanwhile, with Eighth Army in the middle of its offensive across the Sangro River line, an ever-growing stream of battle casualties was reaching the Bari hospitals. Consequently, it was impossible for the medical staffs to really concentrate on the Bari survivors. The mysterious dermatitis of the patients was classed *NYD* — Not Yet Diagnosed.

Very soon, almost from the day after the raid, patients from the harbour disaster began to die. They passed away abruptly and without apparent reason, leaving the medical personnel in great confusion. On December 5, at a loss to explain the mysterious deaths, the Bari medical staff alerted General Fred Blesse, Deputy Chief Surgeon at Allied Forces Headquarters at Algiers. Blesse sent Lieutenant Colonel Stewart F. Alexander of the US Army Medical Corps, the Consultant Officer, Chemical Warfare Medicine, to investigate the matter. By good fortune, Colonel Alexander was expertly qualified for this particular task. In 1941, while at the Army's Medical Research Division at Edgewood Arsenal, Maryland, Alexander had conducted research into the effects of mustard and nitrogen mustard agents and he was an acknowledged expert on the matter.

Flying to Bari at once, the first thing Alexander noted when he visited the hospitals was the all-permeating odour of garlic. Examining the patients, he concentrated on the skin lesions. Although the appearance and timings of the blisters did not all fully accord to the textbooks (the fact that the mustard had mixed with oil and water caused many variations of the skin irritations), Alexander immediately gave his opinion that the men had been exposed to mustard in some manner. However, he was unsure about exactly what kind of mustard. The lesions were not severe enough for it to have been liquid mustard, and the distribution of burns over the patients' bodies spoke against mustard vapour. Just prior to Alexander's arrival, many patients had begun to cough and bring up blood-tinged sputum, symptomatic of respiratory tract infections. X-rays indicated that it was the burns sustained during exposure to the harbour water that were causing these symptoms which indicated that whatever chemical was involved, it had certainly been present in the water.

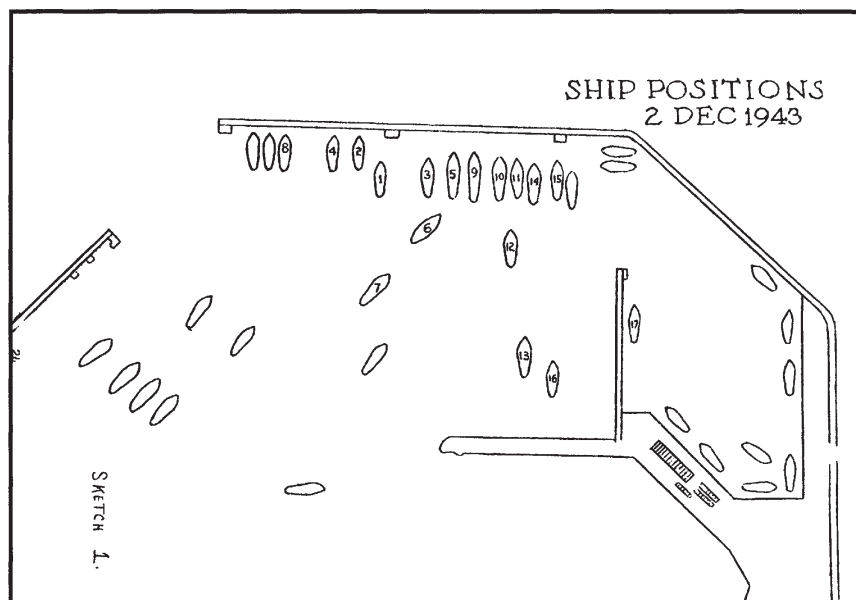
Alexander now faced two questions. Before he could prescribe proper treatment, he had make sure that the toxic was indeed what he suspected, namely mustard; and

secondly, if it was mustard, he had to determine where it had come from. He knew that mustard was stockpiled by the US Army at various depots around the globe but was it at Bari?

To answer the first question, Alexander ordered autopsies on the men who had died, analysis of tissue samples, and chemical analysis of the oil from the harbour. The first pathology reports seemed to confirm his belief that the culprit was mustard, but definite proof came when examination of a bomb casing, which had been recovered from the floor of the harbour, showed definite traces of mustard. At first, this gave new fire to the rumour that the Germans had

dropped poison gas bombs, but ordnance officers of the Fifteenth Air Force soon identified the casing as an American type M47A1 100lb bomb.

However, this did not stop the rumour that the Germans had used poison gas from spreading very rapidly across the city. Gas masks were prepared for immediate use, as many soldiers believed that the Germans would repeat the operation with more chemical bombs. Refugees refused to return to the city, preferring to stay in the countryside. For days, it was generally believed by soldiers and civilians alike that a huge retaliatory raid by American bombers was being planned. Many feared that a new



As soon as Alexander entered the hospital, his suspicions were aroused by the unmistakable smell of garlic — the tell-tale odour of mustard gas. Examination of the burns confirmed his suspicions, although first thoughts were that the Germans had finally resorted to the use of poison gas. Alexander was aware that the Allies had deployed mustard in the Mediterranean Theatre and the discovery of a piece of an M47A1 bomb casing appeared to confirm that American material was the cause. However, there was no report of the gas having been stored at Bari and the port authorities denied knowledge of mustard on any of the ships which had been bombed. In the end, Colonel Alexander was forced to compile his own rough map showing the location of each ship and the number of casualties attributable to each. It soon became evident that the *John Harvey* was at the epicentre: only then did the British administration finally admit that the ship had been carrying gas bombs.

Once the true cause of the deaths and injuries was confirmed, remedial action could be taken, but for many it was already too late. There had been over 70 service deaths in the first two weeks and an unknown number of civilians had died having received no treatment at all. This routine signal was despatched to Washington on December 12 by the US naval commander in North Africa, but still no mention was made of poison gas being responsible.

phase of the war — one of all-out chemical warfare — had begun.

With mustard now established beyond doubt, Alexander advised the hospitals of the proper treatment. The blisters were punctured and drained, with the skin of the blisters left intact as a protection under the sterile dressing. Prophylactic sulfanamide therapy was prescribed for all the victims with irritated respiratory tracts, together with nose drops, gargles, mouthwashes and steam inhalations. Unfortunately, in many cases this treatment came too late and, to the desperation of doctors and nurses, the number of deaths even increased. By December 17, 69 patients had died from the effects of the mustard, either because of body surface burns, or through the intoxication of internal organ systems. In many cases, blast damage to the lungs or bacterial infections that would not otherwise have been lethal, when combined with the mustard effects, produced death. In all, some 84 servicemen died from mustard-related causes in the Bari area. However, the true number was much greater, as many of the American patients were transferred to hospitals in other parts of Italy, North Africa, Britain and the United States, and died without it ever being recognised or recorded that they were victims of mustard poisoning.

For the bewildered civilian population of Bari, there was very little medical aid. A few of the injured managed to get admitted to the jammed Allied hospitals, but most were turned away. With no treatment, the Italians suffered alone and died alone. Exactly how many succumbed in the aftermath of the raid is unknown, the best estimate being at least 1,000.

Meanwhile, Colonel Alexander was still trying to determine the source of the toxic agent. Although the bomb casing recovered from the harbour strongly suggested that an Allied ship was carrying a cargo of mustard,

Although Churchill wholeheartedly supported the use of poison gas, and had publicly threatened Germany on a number of occasions with retaliation 'on the largest possible scale' should the Germans use gas against Britain or Russia, it is reported that he absolutely refused to accept that the casualties at Bari had been caused by Allied mustard. It was a position he appeared to maintain in his post-war memoirs (published in 1952), long after any need for secrecy, when he simply stated that 'a very damaging surprise attack on our crowded harbour of Bari on December 2 blew up an ammunition ship with a chance hit and caused the sinking of sixteen other ships and the loss of 30,000 tons of cargo'. Eisenhower, the Theatre Commander, also glossed over the attack in his 1948 memoirs when he stated that 'the greatest damage arose from the fact that a fuel ship was struck and the escaping oil carried fiery catastrophe to many neighbouring vessels . . . [and] could have had the most unfortunate repercussions . . . Fortunately the wind was off-shore and the escaping gas caused no casualties.' Right: This memorial with its all-embracing inscription to 'all those who died at sea' now stands on the Molo San Vito.

NAVAL MESSAGE		NAVY DEPARTMENT	
DRAFTER	EXTENSION NUMBER	ADDRESSEES	PRECEDENCE
FROM COMNAVNAV		ASTERISK (*) MAILGRAM ADDRESSEE	
RELEASED BY		COM 10TH FLT C&R	PRIORITY
DATE 12 DECEMBER 43			ROUTINE
TOR CODEROM 1937/12			ROUTINE
DECODED BY CROMPTON			DEFERRED
PARAPHRASED BY SHOAF			
ROUTED BY SOBEL			
UNLESS OTHERWISE INDICATED THIS DISPATCH WILL BE TRANSMITTED WITH DEFERRED PRECEDENCE AND AS ADMINISTRATIVE			IF OPERATIONAL CHECK BELOW
121423 NCR 5019			☐
ORIGINATOR FILL IN DATE AND TIME:	DATE	TIME	GCT
ON OUTGOING DISPATCHES PLEASE LEAVE ABOUT ONE INCH CLEAR SPACE BEFORE BEGINNING TEXT			ACTION
(COMNAVNAV SENDS. COM TENTH FLT C&R ACTION.)			F-0
FOLLOWING U.S. MERSHIPS SUNK AS RESULT AIR RAID ON BARI			F-01
DEC 2. JOHN L MOTLEY ARMED GUARD 4 SURVIVORS 5 DEAD 28			F-02
MISSING CREW 15 SURVIVORS 3 DEAD 27 MISSING. JOSEPH			F-05
WHEELER ARMED GUARD 13 SURVIVORS 15 MISSING BELIEVED DEAD			F-07
CREW 15 SURVIVORS 26 MISSING. JOHN HARVEY ARMED GUARD NO			F-1
SURVIVORS 28 MISSING CREW 2 SURVIVORS 38 MISSING. SAMUEL			F-2
J TILDEN ARMED GUARD 28 SURVIVORS CREW 28 SURVIVORS INCLUD			F-20
ING MASTER 9 MISSING 1 DEAD. JOHN BASCOM ARMED GUARD 25			F-3
SURVIVORS 1 MISSING 2 DEAD CREW 39 SURVIVORS 4 MISSING 1			F-30
DEAD. RECORD NATIONALITIES NOT AVAILABLE. ALL CLASSIFIED			F-31
PUBLICATIONS SUNK IN ALL SHIPS EXCEPT BASCOM RECOVERED BY			F-32
MASTER FROM WRECK.			F-33
FX37...ACT			F-34
COMINCH...200...16...23...BUPERS...CNC...39...NAVAIDE			F-4
DECLASSIFIED DECLASSIFIED DECLASSIFIED			FX01
Make original sets. Deliver to Code Room Watch Officer in person. (See Art. 76 (1) NAVREGS.)			FX30
			FX37
			FX40
			IC-00
			IC-00





Forty years later, Mr Bertram Stevens, who was serving in the Royal Navy in Bari in December 1943 and had been discharged in 1948, put in an application to the Department of Social Security for a war disability pension because of pulmonary fibrosis and inflammation of the corneas of his eyes which he claimed had been caused by his exposure to the mustard gas. As his medical record stated that he had suffered burns due to an 'irritant vapour', his claim was granted by the government in

March 1986, to be backdated to 1943. Of the 693 British casualties known to have arisen at Bari, 161 were killed or declared missing. It was announced in Parliament in February 1991 that an effort in 1986-87 by Social Services to trace the remainder only resulted in 106 successful claims for disability benefit. *Above:* So back to Bari today. Whether it is a genuine relic from 1943 or not, this wreck alongside the Vecchio Molo Foraneo in May 1992 was just too good to leave out.

the British port authorities denied any knowledge of such a load in any of the ships. To pinpoint the source of the toxic, Alexander therefore adopted an unorthodox method. With the help of the port authorities, US military officials, dockworkers and survivors, he compiled a sketch of the harbour on which was shown the position of each ship as it was on the night of the raid. By correlating the deaths in the hospitals with the ships' positions, he was able to prove that a predominant number of these deaths occurred near one certain ship: the *John Harvey*. It was only after he confronted the British port officials with his findings, that they finally admitted that the *John Harvey* had been carrying 100 tons of mustard bombs.

After his return to Algiers, Colonel Alexander wrote a preliminary report, which mainly concentrated on the medical aspects of the disaster and the lessons to be learned from it. Dated December 27, 1943 and classified 'Secret' (which equalled British 'Most Secret'), copies of the report were sent to the hospitals in Italy, to Edgewood Arsenal in the United States, and to its British equivalent at Porton Down in Wiltshire. However, when British Prime Minister Winston Churchill heard of it, he refused to believe that there were any mustard gas casualties at Bari. He simply would not accept that any of the casualties were caused by mustard. The argument continued for several days, with messages being relayed back and forth between Algiers and London at a furious pace, but Churchill refused to be convinced. Eisenhower, assured that Alexander's diagnosis was correct, approved the report and it was entered into the official records. Churchill, on the other hand, directed that all British records be purged of any mention of mustard and refer to the burns as 'due to enemy action'.

With 17 ships sunk and over 1,000 casualties, the raid on Bari had been a catastrophe

even without the involvement of poison gas. From a strategic point of view, the loss of ships, supplies, equipment and men at Bari on December 2 seriously affected the land operations of the Allied armies in Italy. It had direct consequences for the Anzio landing, planned to take place the following month to break the deadlock at Cassino, and vitally delayed the build-up of the US Fifteenth Air Force around Foggia. To make matters worse, the German raid had completely blocked the harbour and it took US and Royal Navy salvage teams three full weeks before the port could be re-opened.

None of the Allied news releases relating to the raid on Bari ever referred to the mustard. Initial press releases tried to play down even the losses suffered in the raid

itself, and it was a fortnight before the *Washington Post* broke the story of just how devastating the air strike had been. The *Post* called it 'the costliest sneak attack since Pearl Harbor', not suspecting that the story hid a much greater secret. Even the casualties of the raid who were fortunate enough to recover did so without knowing what had actually happened to them at Bari. The true story behind the raid of December 2, 1943 remained hidden for nearly 30 years and only became known to a wider public when American historian Glenn B. Infield published his *Disaster at Bari* in 1971. Even during his research, Infield had found great reluctance among the British military establishment to discuss the Bari incident or to co-operate with his investigation.



And at Berth 29 where the *John Harvey*, the mustard ship, was tied up, a loose mooring line still dangles from the bollard from which the rope burned away in 1943. No, surely this couldn't be . . . could it?



At 11.35 p.m. on September 1, 1939, radio listeners in Germany were roused from their daily routine by a loud flourish of trumpets. What followed was the very first Wehrmachtbericht, the daily news bulletin from the war theatres: 'The High Command of the German Armed Forces announces: By order of the Führer and Supreme Commander, the Wehrmacht has taken over the protection of the Reich. In fulfilment of their order to put a stop to the Polish violence, units of the German Army have started a counter-attack across the border this morning. At the same time, Luftwaffe squadrons have started to attack military targets in Poland. The Kriegsmarine is protecting the Baltic.'

It is generally accepted that the Second World War began on that first day of September when the German tank armadas poured across the border into Poland. However, the first shots of the war were actually fired six days, four hours and 44 minutes before its official outbreak.

On the night of Friday, August 25, one of the days of hectic activity which preceded the outbreak of war, Oberstleutnant Erwin Lahousen was walking restlessly through the extensive corridors of the OKW headquarters building on Tirpitzufer in Berlin, waiting for a signal which was to become the first operational message of World War II. Meanwhile, long motorised columns of dust-covered troops jammed the roads heading east, while in the other European countries reservists were called up to service.

A former officer in the Austrian Army and member of its intelligence service, Oberstleutnant Lahousen was now head of a department in the Amt Ausland-Abwehr and in charge of sabotage and sedition. The Abwehr was the intelligence department of the German Armed Forces High Command, and after 1933 the organisation came into frequent conflict with the Party and state intelligence departments, the SD and the Gestapo. When he was appointed head of military intelligence in 1935, Admiral Wilhelm Canaris succeeded in reaching an agreement with Reinhard Heydrich, head of the SD, which, while acknowledging the SD's role in state security, retained for military intelligence a central part in espionage. Abwehrstellen (Counter Intelligence Offices) in Germany were based on army districts, but when war came, more outstations opened throughout occupied Europe and in tolerant neutral countries.

INCIDENT AT MOSTY

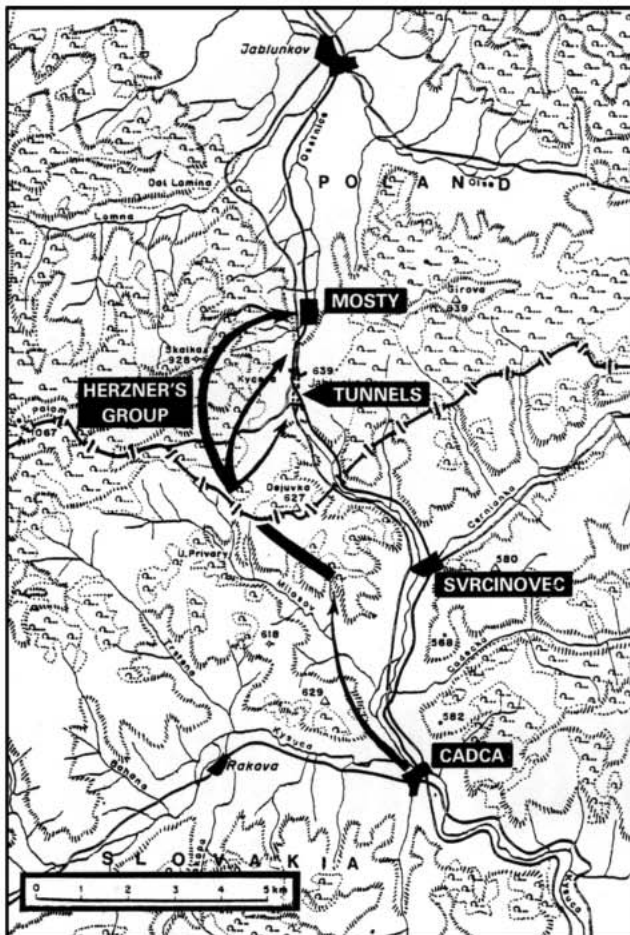
By Jan Heitmann

Since his days with the Austrian General Staff, Oberstleutnant Lahousen had been an expert in East European affairs and he and his chief, Admiral Canaris, had given the dislocation of the Polish armies their most careful consideration. Instead of assembling their armies in rear defence areas east of the Weichsel and San rivers to allow a delaying defence in depth, the Polish General Staff had placed them in blocking positions right behind the border. This deployment led to the German operational plan to destroy the Polish forces in a lightning operation. However, before this could be done, the traffic facilities which were of greatest overall importance for the German advance, had to be protected from destruction. This task was assigned to small groups dressed in civilian clothes which would penetrate the frontier in front of the advancing Wehrmacht before the real fighting began.

Throughout the preceding months, Lahousen had been recruiting ethnic Germans and dissident Slavs from several eastern European countries, and these German-born 'Volksdeutsche' and members of other ethnic minorities demanding independence from the Polish state had been specially trained and split up into small units which were now stationed in villages along the border to Poland. They were divided into KO-Groups (Kampforganisation, combat organisation) and SO-Groups (Sabotageorganisation). The KO-Groups were to prevent vital objectives being destroyed by the enemy while the SO-Groups were to demolish or immobilise targets and objectives which were of prime importance for the enemy's defence.



Above: Oberstleutnant Erwin Lahousen (seen here seated second from the right at a conference in Berlin with the Grand Mufti of Jerusalem) was the Abwehr's expert on eastern affairs and the architect behind the secret operation at Mosty before the outbreak of war. **Top:** His 'troops' were ethnic Germans mostly living in eastern Europe, who were formed into combat and sabotage groups to operate in civilian clothes and pave the way for the conventional forces.



Lahousen detailed Leutnant der Reserve Dr Hans-Albrecht Herzner (*above*) to lead the attack on Mosty which was designed to capture and hold the vital railway tunnels in the Jablunka Pass (between German-occupied Slovakia and Poland) to prevent its destruction by Polish forces.

Later, most of these groups were integrated into the famous Brandenburgers, the Abwehr's own 'private army'. Officially designated Baulehr-Kompanie z.b.V. 800 (Construction Training Company 800 for Special Duties) and formed in October 1939, these were special services units, the German equivalent of the British Commandos or US Rangers. The men selected were often multilingual and were stationed on an estate near the town of Brandenburg, hence the name. They were trained both to defend and to demolish bridges or fortifications. During the war, Brandenburgers with a knowledge of the local language were often used in disguise, and one unit was also used as a long-range desert patrol in North Africa.

The General Staff had chosen two strategic objectives which were considered of vital importance for the German advance into Poland. According to the plan of Abwehrstelle Königsberg, one KO-Group was to capture the railway bridge at Dirschau near Danzig which was a vital link between East Prussia and Poland, and prevent its destruction. Meanwhile two other KO-Groups far to the south were to attack and capture the Jablunka Pass and the railway tunnel through the West Beskids, a range of the Carpathian mountains along the border of Poland and German-occupied Slovakia. The Beskids are commonly divided into the West and East Beskids. The western portion is the higher and rises to a maximum elevation of

over 1,700 metres. The range is only a minor barrier to transportation as the mountains are crossed by the Jablunka road and railway pass. Here, south of the station at the village of Mosty, traffic between east Germany and south Poland into the Balkans and Austria is channelled through two single-track railway tunnels. At the time, this line was the shortest railway connection between Warsaw and Vienna and, being in the centre of the area of operations covered by Heeresgruppe Süd, the demolition of the tunnels would be a grave handicap to the German advance. Both the tunnels and the pass, therefore, had to be captured to prevent them from being destroyed by the enemy. This task was of vital importance as movement off the few



The Jablunka Mountains are situated in the historic region of Teschen (Czech: Cesky Tesin; Polish: Cieszyn or Olsa area), which remained a part of Austria until the end of World War I when it was claimed by both Poland and Czechoslovakia. Attempts to settle the question by plebiscite failed in 1919, but the following year the Paris Peace Conference partitioned the territory between the two countries. Following the Munich Agreement of 1938, by which Germany acquired the Sudeten-



land from Czechoslovakia, Poland seized the whole of the Teschen area. *Left:* Half-way between the pass and the village of Svrcinovec is the frontier between Teschen in the north and the former Socialist Republic of Slovakia in the south. In the days of August 1939, this line marked the German border with Poland. *Right:* Huge concrete blocks which were once used to seal the route are today still lying beside the road at the northern entrance to Svrcinovec.



It was fortunate that Leutnant Herzner had a sense of history as he took along his camera to record the operation. As one of the Jablunka KO (combat) Groups got lost in the dark, only Herzner and thirteen men reached the objective. This picture of the successful party was taken by Herzner's driver, Gefreiter Jung.

roads in the area was only possible for mountain infantry because the paths through the mountains were too steep even for handcarts.

The order issued to KO-Groups Jablunka and Silles for the assault stated that the group was to take the station at Mosty and to prevent the destruction of the railway tunnels by removing the detonators and keep the tunnels and road open for the following troops. Thereafter, the tunnels were to be occupied and all explosives removed. Abwehrstelle Breslau, which was in charge of all Abwehr activities in this area, knew from an agent that there were four explosive charges buried inside the two tunnels and that the bricks hiding the charges were marked with red crosses. Agents also reported that the station was guarded by one platoon of infantry and the tunnels by about fifty pioneers who had erected a road-block on the pass road and a wire entanglement across the track at the southern entrance of the tunnels.

Leutnant der Reserve Dr Hans-Albrecht Herzner, an officer of Abwehrstelle VIII in Breslau, was the man detailed to carry out the mission. He was a reserve officer with the famous Infanterie-Regiment 9 in Potsdam and had been working for the Abwehr for some time. An active member of the resistance against the Nazi régime, he had been party to General von Witzleben's plot to remove Hitler by force in September 1938. He was known as a strong Christian and conservative and as a man of great personal bravery, reliability and with a stout fighting morale.

Leutnant Herzner had 24 Volksdeutsche of KO-Group Jablunka under his command, including a number of SA men and border police who knew the area like the back of their hands. Like the other Abwehr operatives and similar assault and sabotage teams of the SD preparing for sabotage acts over the frontier, Herzner's men lay hidden in a remote village, waiting for the order to commence operations.

Oberstleutnant Adolf Heusinger, staff officer in the General Staff, later the head of its operational department (later to become a senior officer in the West German army and chairman of NATO's Military Committee), informed Admiral Canaris and Oberstleutnant Lahousen on Friday, August 25

that Hitler had set the following day for the invasion of Poland, beginning at 4.30 a.m. Later, Hauptmann Gaedke, one of Heusinger's aides, transmitted the order that the KO- and SO-Groups were to go into action at 8.00 p.m. that evening. A few hours after this message was received, a Dr Heinrich Herzog, ostensibly a businessman, left Breslau in Germany in a private car and crossed into Slovakia. In fact, he was none other than Leutnant Herzner travelling with forged papers. After he left the border, he went directly to the divisional HQ of 7. Infanterie-Division at Cadca where he received detailed orders for the forthcoming raid.

At 9.00 p.m. on Friday, Herzner assembled his men in the barracks at Cadca. With the exception of Herzner and his driver, Gefreiter der Reserve Jung, who wore regular German military uniforms, the remaining 24 men of his group were wearing 'Räuber-

zivil' — rough-and-ready civilian clothes with a swastika armband. Each man was armed with a machine carbine, four magazines and a pistol. The group was divided into two assault parties, and both left by truck for a point north-west of Svrčinovec not far away from the border. There they dismounted and proceeded on foot to a hill called Dejvka where they were due to meet the Silles KO-Group, consisting of a hundred Hlinka (Slovak Fascist Guard) guardsmen and 40 Slovak volunteers. However, when this party failed to arrive, Herzner crossed the border alone with his men just west of Point 627 near Dejvka. The time was exactly thirty minutes past midnight.

Realising that this was a historic moment, Herzner took his message pad and wrote out the signal for which Oberstleutnant Lahousen was so anxiously waiting.

Wahrscheinlichkeit	Wahrg.	Ort	Tag	Jahr
Wahrg.				
Wahrg.				
General-Kommando VIII. A. K. Ic AO II, Breslau Wahrg. am 25. 8. 1938 Kampfororganisation Jablunka 627 nord-nordwestl. Cadca. Herzner Hans Albrecht Herzner mit Jung				

Written on an ordinary Wehrmacht message pad, this was the first operational message of the Second World War: 'Generalkommando VIII. AK. Ic AO II, Breslau. Crossing Polish border with K.O.J. [Kampforganisation Jablunka] at 00.30 hours near point 627 north-north-west of Cadca. [signed] Herzner. By army telegraph and wireless.'



Now Herzner pictures Jung with the group. Only he and his driver wore regular German military uniforms, the others being attired in 'Räuberzivil' (robbers' civvies) — rough-and-ready civilian clothes with an NSDAP swastika armband.

Successfully outflanking Polish sentries and border patrols, the men entered the forest heading north-east. Herzner's guides lost their way several times and one party got split up in the darkness, so it was not until 2.45 a.m. that Herzner, with Gefreiter Jung and twelve men, reached the hills west of Mosty railway station. During their advance they had noted that the foxholes, pillboxes and machine gun emplacements on the top of the pass were not manned, although the northern exit from the tunnels was seen to be guarded by military personnel. At about 2.00 a.m., they had heard the sound of firing coming from that direction and they later learned that the missing group had bumped into the tunnel guards and, in the exchange of fire, a Polish guard had been killed.

Herzner waited for nearly two hours for the party to arrive from along the railway track. Meanwhile, other pro-German volunteers and undercover members of KO-Group Jablunka from Mosty and the hamlets nearby had joined the attackers, but the majority melted away again following the raid. As it was beginning to get light, Herzner decided that he could not wait any longer and gathered his thirteen men together for a final briefing.

At 3.30 a.m., they launched their attack on Mosty station. The objectives were the station building, a warehouse, a hut which was used as accommodation for the tunnel guards, a domestic office and an officer's quarters located in a wooden hut. There was little resistance from the guards who were quickly rounded up and searched for weapons. The station and track were secured and the telephone and telegraph lines were immediately cut. From the interrogation of a German-born station official, Herzner learnt that the detonators and explosive charges both at the station and the tunnels had already been removed. However, although it seemed as if the Poles had done Herzner's work for him, there was no time to relax.

At 4.15 a.m., the Polish tunnel guards launched a counter-attack from the northern side of the pass. Simultaneously, the KO men were exposed to fire from the western side of the station and then from the east. This attack was repulsed as were two further assaults, one of Herzner's men being slightly wounded. Anxious to reconnoitre the tunnels and to report to Cadca on the situation,



Looking down on Mosty station — then and now.



After the war was over in 1945, a Polish officer reported on the topographical situation in the Mosty area: 'From Mosty railway station, the railway line ran for approximately 500 metres across level ground (*left*), but for the next 500 metres it approached the tunnel through a kind of cutting. At the entrance to the tunnel, the cutting was 12–15 metres deep.



Half-way between the station and the tunnel there was a level crossing and a gate-keeper's house. From this spot one had a good view of both the station building and the platforms. It was not possible to see the platforms from the tunnel entrance (*right*) or even from the top of the entrance. The two single-tracked tunnels were each 800 metres long.'



Herzner ordered one of his men, Josef Kulik, a native of Jablunka and currently a member of the Cadca border police, to man one of the locomotives waiting under steam in the station and use it to take a message to the HQ of 7. Infanterie-Division in Cadca.

However, completely unknown to Herzner and his men, that Friday the political situation had changed dramatically. While Mussolini informed Hitler that Italy would not be ready for war for another three years, Britain signed a treaty with Poland which turned the unilateral guarantee of Polish independence into a pact of mutual assistance. Fearing that France and Britain would declare war on Germany if he invaded Poland, just ten hours before the estimated time of attack Hitler ordered his generals to halt everything at once to allow more time for negotiation.

Frantic calls were made right down to battalion level. Admiral Canaris was informed by Hauptmann Gaedke that Hitler had called off the invasion of Poland for political reasons and was entreated by him to do everything humanly possible to halt his commandos. All the other groups were successfully contacted and stopped, but the Abwehr failed to reach Herzner. This led to confusion in the Abwehr HQ in Berlin and caused Canaris to personally take a hand in searching for the lost group. The thought that Herzner and his men might be approaching Mosty station at that very moment without knowing that Hitler had called the war off made him feel not a little uncomfortable. His fears that his KO-Group might be the cause of an international incident, with far-reaching consequences, grew even more when Lahousen told him that an Abwehr officer, Hauptmann Ernst zu Eicken, had reported that Oberbaustab XX ('Higher Construction Staff No. 20' — the code name for 7. Infanterie-Division during the phase of the final assembly) at Cadca had

Herzner's photograph of the northern entrance to the tunnels as seen from the level crossing. The road through the pass, leading to the border and on to Cadca, is on the right behind the trees.

heard small arms fire from the direction of the Jablunka Pass at 4.45 a.m. and that Abwehrstelle VIII at Breslau assumed its source to be the KO-Group commanded by Leutnant Herzner.

At 11.00 a.m., Meldekopf Striegau, a field agency of Abwehrstelle Breslau, eventually made contact with Herzner and reported to Lahousen: 'Leutnant Herzner is still in Poland. Tunnel undamaged. Two wounded'.

This meant that there were still German soldiers on the territory of a neutral country who had been involved in some sort of fire-fight with the Poles. In fact, Herzner had already despatched the following message to VIII. Armeekorps: 'Seized railway station Mosty at 03.55 a.m. together with Gefreiter Jung and 12 men of KOJ. One casualty. Counter-attack by tunnel guard against station repelled.'



Today the area north of the tunnels is densely overgrown with trees, bushes and brushwood.



Left: Also pictured by Leutnant Herzner, some of the members of KO-Group Jablunka sitting on top of the southern entrance to the westernmost tunnel. It was from this direction that Josef Kulik emerged aboard the train after having cut the wires to the



demolition charges. Right: Although one is still not supposed to photograph any traffic facilities in Czechoslovakia, railway workers turned a blind eye when Jan Heitmann matched the shot.

Meanwhile, events at Mosty were still proceeding apace. Accompanied by another border policeman and two Polish stokers, at about 7.00 a.m., Kulik set off towards the tunnel aboard his engine. A Polish railway policeman opened fire on the locomotive and more intense shooting came from several machine gun emplacements, but Kulik returned the fire, hitting a man in military uniform. As soon as the engine was in the tunnel, Kulik jumped off and cut the wires which led to the explosive charges with an axe. When the locomotive emerged from the other end of the tunnel, the crew was again confronted with a barrage of machine gun fire and hand grenades. The engine continued on until it was stopped by a barrier blocking the track, but Kulik forced a signalman to remove the obstruction. Immediately thereafter, Kulik and his crew came under another attack at which point the track behind them was blown up.

Arriving at Cadca at about 8.00 a.m., Kulik was taken to a battalion HQ at Rakowa, where he met Generalmajor Eugen Ott, the divisional commander. The general ordered Kulik to report to his chief operations officer, Major Paul Reichelt, who was still at Cadca station, desperately trying to get in touch with Herzner by way of the railway telephone system. Nearly driven to desperation, Major Reichelt continued in vain to get through to Mosty station, making several futile attempts using the normal telephone line via Jablunka, but all the lines to Poland were dead. It was not until 9.35 a.m. that he suddenly got through to Mosty. Herzner was ordered to release his prisoners and return immediately to the border using the shortest possible route.

There was no time to waste and Herzner and his men quickly boarded one of the remaining locomotives. Travelling south, they approached the tunnel just in time to see the Poles blowing up the line. In danger of being trapped, Herzner's group had to steam back to Mosty station under fire, where he got through to Cadca and reported to Major Reichelt on the situation. Reichelt then ordered him to force a way westwards to the Slovakian border. However, Herzner and his men encountered resistance from the south-west, west and north-west of the station, provided by the Mosty police and the tunnel guards. The KO-Group returned the fire before turning to the north-west in the

direction of Dol Lomina. They finally crossed the Slovakian border north-north-west of Rakowa at 1.30 p.m. on Saturday without having sustained any further casualties. They had been on 'enemy' territory for just over 12 hours.

Meanwhile, a high-ranking Polish officer had sent a protest to Cadca, complaining strongly against the breach of Polish neutrality. The German commanding officer apologised and stated that the raid was a mistake due to the unclear line of the border in the dense forest. At 10.00 a.m., a civilian emissary was sent to Mosty to negotiate with General Kustron, commander of the Polish 21st Division and, an hour later, Kustron himself met with staff officers of 7. Infanterie-Division at the turnpike north-west of Svrčinovec. Later, Major Reichelt ordered Josef Kulik to take three Polish policemen from Cadca to Mosty where he was told to get in touch with the local military authorities. Kulik was detained by the Polish military and subjected to interrogation. Then he was sent to Rakowa to bring a German general to the border to negotiate over the fate of those of Herzner's men who were still on the wrong side of the frontier.

Canaris breathed a sigh of relief when he received the message that Herzner had safely reached German-occupied Slovakia. Suddenly, however, the High Command, believing that Herzner's men were still in Poland, issued orders that the KO-Group was to remain in Poland for the time being, which made Canaris and Lahousen wonder if this meant that war was about to commence after all. Five days later they knew what it meant, when, at 5.30 p.m. on August 31, the order was issued to open hostilities the next morning. Canaris commented on the delivery of the order with depressing foreboding: 'This means the end of Germany.'

The next morning, the German armies swept into Poland. Preceding the conventional forces were a number of KO- and SO-Groups, including that of Leutnant Herzner. Contrary to what has been stated elsewhere, KO-Group Jablunka did not repeat the operation they had carried out the week before. This was now the responsibility of a battalion from Infanterie-Regiment 62, a regular Wehrmacht unit, which was merely accompanied by some of Herzner's men as guides. However, this time the Poles were on the alert and strong reinforcements were



The southern entrances to the tunnels, with the western tunnel on the left and the eastern on the right. This is where Kulik came under fire when the locomotive emerged from the tunnel, and must be close to the spot where the track was blown up.

Dienstreise
 des **Leutnants Herzner** von 24.8. bis 28.8.1939
 nach **Ostern (Slovakien) 113.7 RM.**

Abreise am 24.8.1939 um 18⁰⁰ Uhr
Anreise am 28.8.1939 um 18¹⁵ Uhr.

Grenzübergang am 25.8. um 05³⁰ Uhr (Slovakien)
 • 25.8. • 05³⁰ Uhr (Polen)
 • 26.8. • 15³⁰ Uhr (Polen-slovakische Grenze)
 • 26.8. • 12⁰⁰ Uhr

24./25.8.1939	1 Übernachtung	5,-- RM
25.8.1939	1 Auslandsstagesgeld	19,80 *
26.8.1939	0,6 von 1 Auslandsstagesgeld (Polen) 10,40 RM =	11,04 *
26.8.1939	0,4 von 1 Auslandsstagesgeld (Slovakien) 13,80 =	5,52 *
27.8.1939	1 Auslandsstagesgeld	19,80 *
28.8.1939	0,5 von 1 Auslandsstagesgeld von 13,80 =	6,90 *
Summe:		55,86 RM

In Worten: **Funfundsünfzig 86/100 Reichsmark**
 von der Kasse der 1. in Wehrkreis VIII
 erhalten zu haben bescheinigt.
 Breslau, den 1. September 1939.
 Lt. d. R.

Back cover: A final pose for the camera for Leutnant Herzner and his men on the station platform before pulling out — a nice picture for his victory album. However, his successful mission was to no avail, for Polish forces quickly put more explosives in the tunnels and when war came five days later the charges were set off. Repair work was not finished until 1948. **Above:** Because his operation was not an official military one, Herzner claimed all his expenses, totalling 55.86 RM (worth some £125 in today's money) — a gem example of German bureaucratic punctiliousness!

prepared to give the Germans a warm welcome. Within days, Polish engineers had placed 40 explosive charges in demolition chambers in the tunnels, each containing 500 kilograms of Trotyl. The demolition chambers were connected by gas pipes which were also filled with explosive. This enabled Lieutenant Pirszel, the Polish engineer officer in charge, to demolish the tunnels within a few seconds without any further preparation. At the southern entrance to the tunnels, parts of the rails had been either cut or removed.

Although Mosty station was captured a second time after a short battle, this time the attackers were unable to prevent the Poles from blowing up the tunnels. Many other bridges in the area were also demolished by Polish engineers. On September 2, the Wehrmachtbericht reported: 'In the afternoon of September 1, the successful advance of the German armies continued. This morning the attack is in full swing. The Jablunka Pass has been quickly seized.'

When Germany went to war again in 1939, Hitler once again revived the military award of the Iron Cross 'for the sons of Germany, as in the past great wars in the defence of the home and the fatherland'. Herzner was recommended by Admiral Canaris for the Iron Cross 2nd Class, but Generaloberst Keitel, Chief of the Armed Forces High Command, at first refused to give his approval because, according to the award regulations, it could only be won for acts performed while Germany was at war. It took nearly two months until Keitel finally relented. Thus, while Herzner was not the first soldier who received the 1939 Iron Cross, he was the first Serviceman who distinguished himself to be awarded this decoration in the Second World War.

Operation 'Barbarossa' found Herzner, since promoted to the rank of Oberleutnant, serving with Regiment Brandenburg as a company commander. Together with three other companies of anti-Soviet Ukrainians of that formation, Herzner's unit arrived in Lemberg on June 30, 1941 for Operation 'Nachtigall', the Abwehr's attempt to raise the Ukraine against Moscow. At first, Herzner and his comrades were wholeheartedly welcomed by the Ukrainians but, within a few days, the Ukrainian revolutionary leader, Stefan Bandera, declared an independent Ukraine, without consulting the 'Nachtigall' officers or the Abwehr. Berlin was outraged and the Ukrainian leaders were arrested by Gestapo, SD and SS commandos.

Like many of the other 'Nachtigall' men, Herzner was shocked, for hardly had the operation commenced than it was all over. Admiral Canaris, travelling to Lemberg on July 30 for an inspection of Herzner's unit, was unable to change the situation. Two days later he called off Operation 'Nachtigall' and Herzner and his mixed German-Ukrainian unit were sent back to Germany.

In 1942, the army used Brandenburg units to defend their rear against Soviet partisan attacks as they retreated from the Caucasus. At the same time the Brandenburgers were increased to divisional size. To meet the requirements for reinforcements, the Brandenburgers were increasingly used as ordinary infantry.

Meanwhile, Herzner had been injured in a car accident and admitted to the famous hospital in Hohenlychen. There, while carrying out swimming therapy to help mend his broken spine he accidentally drowned in September 1942. After a military funeral in the Potsdam Garrison Church, he was buried in Potsdam cemetery.



**Im Namen des Führers
und Obersten Befehlshabers
der Wehrmacht**

verleihe ich
dem

Leutnant d. R. **Hans-Albrecht Herzner**

das
Eiserne Kreuz 2. Klasse.

Berlin, den 29. Oktober 1939


Generaloberst
und
Chef des Oberkommandos
der Wehrmacht
(Dienstgrad und Dienststellung)



The award citation for Herzner's Iron Cross Second Class. When Canaris recommended Herzner for the decoration, Generaloberst Keitel refused to approve it because, according to the award regulations, it could only be awarded for acts performed



in time of war. Finally, Keitel relented and signed the award certificate on October 29, 1939. Leutnant Herzner broke his back in a motor accident in 1942 and drowned during swimming therapy. He was buried at Potsdam.

